In-Situ Chromium Treatability Study Results Report Nevada Environmental Response Trust Site Henderson, Nevada

PREPARED FOR

Nevada Environmental Response Trust 35 E. Wacker Drive, Suite 690

Chicago, IL 60601

PRESENTED BY

Tetra Tech, Inc.

150 S. 4th Street, Unit A Henderson, NV 89015

Revision 1 June 22, 2018

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	6
1.1 Objective	6
1.2 Site Description	6
1.2.1 Biological Reduction Study Area	7
1.2.2 Chemical Reduction Study Area	7
1.2.3 Regional Geology	7
1.2.3.1 Alluvium	8
1.2.3.2 Muddy Creek Formation	8
1.2.4 Hydrogeology	8
1.2.5 Extent of Chromium Impacts	8
1.3 Report Organization	9
2.0 TECHNOLOGY DESCRIPTION	10
2.1 Biologicial Reduction	10
2.1.1 Emulsified Vegetable Oil	11
2.1.2 Industrial Sugar Wastewater	11
2.1.3 Molasses	11
2.2 Chemical Reduction	11
3.0 LABORATORY BENCH-SCALE STUDIES	13
3.1 Bench-Scale Objectives	13
3.2 Collection and Evaluation of Soil and Groundwater	13
3.3 Biological Reduction Studies	14
3.3.1 Batch Microcosm Studies	14
3.3.1.1 Microcosm Setup and Effectiveness Monitoring	14
3.3.1.2 Results	14
3.3.2 Biological Reduction Column Studies	15
3.3.2.1 Column Setup and Effectiveness Monitoring	15
3.3.2.2 Results	16
3.4 Chemical Reduction Studies	16
3.4.1 Batch Microcosm Studies	16
3.4.1.1 Microcosm Setup and Effectiveness Monitoring	16
3.4.1.2 Results	17

i

3.4.2 Chemical Reduction Column Studies	17
3.4.2.1 Column Setup and Effectiveness Monitoring	18
3.4.2.2 Results	18
4.0 FIELD TREATABILITY STUDY ACTIVITIES	19
4.1 Biological Reduction Study	19
4.1.1 Biological Study Area Geology	19
4.1.2 Biological Study Area Hydrogeology	20
4.1.3 Drilling and Well Installation	20
4.1.3.1 Installation	20
4.1.3.2 Laboratory Analysis	22
4.1.3.3 Management of Investigation-Derived Wastes	23
4.1.4 Aquifer Testing	23
4.1.5 Injections	24
4.1.5.1 Carbon Substrate Injection Event 1	24
4.1.5.2 Carbon Substrate Injection Event 2	25
4.1.5.3 Carbon Substrate Injection Event 3	25
4.1.5.4 Chase/Flush Water	25
4.1.6 Effectiveness Monitoring Program	26
4.2 Chemical Reduction Study	27
4.2.1 Chemical Study Area Geology	27
4.2.2 Chemical Study Area Hydrogeology	28
4.2.3 Drilling and Well Installation	28
4.2.3.1 Installation	28
4.2.3.2 Management of Investigation-Derived Wastes	29
4.2.4 Aquifer Testing	29
4.2.5 Injections	29
4.2.6 Effectiveness Monitoring Program	30
4.3 Permitting Requirements	31
4.3.1 Nevada Division of Environmental Protection – Underground Injection Control Program	31
4.3.2 Nevada Division of Water Resources	31
4.4 Health and Safety	31
5.0 ANALYSIS OF RESULTS	32
5.1 Biological Reduction Study	32
5.1.1 Soil Analytical Results	32

5.1.2 Groundwater Analytical Results	33
5.1.2.1 Hexavalent Chromium	34
5.1.2.2 Total Organic Carbon	37
5.1.2.3 Nitrate	40
5.1.2.4 Chlorate	42
5.1.2.5 Perchlorate	44
5.1.2.6 Chloroform	47
5.1.2.7 Sulfate and Sulfide	49
5.1.2.8 Metals	50
5.1.2.9 Additional Analytes	53
5.1.3 Field Parameters	54
5.1.3.1 Dissolved Oxygen	54
5.1.3.2 Oxidation-Reduction Potential	56
5.1.3.3 pH	58
5.1.4 Microbial Results	58
5.1.5 Hydrogeological Evaluation	61
5.1.5.1 Horizontal and Vertical Groundwater Gradients	61
5.1.5.2 Aquifer Testing	61
5.2 Chemical Reduction Study	63
5.2.1 Groundwater Results	63
5.2.1.1 Hexavalent Chromium	63
5.2.1.2 pH	65
5.2.1.3 Dissolved Oxygen	65
5.2.1.4 Oxidation-Reduction Potential	66
5.2.2 Hydrogeological Evaluation	66
5.2.2.1 Horizontal and Vertical Groundwater Gradients	66
5.2.2.2 Aquifer Testing	67
6.0 SUMMARY OF KEY FINDINGS	70
6.1 Biological Reduction Study	70
6.2 Chemical Reduction Study	71
6.3 Cost Considerations for Implementation	71
6.3.1 Treatability Study Cost Summary	71
6.3.2 Preliminary Indications of Costs for In-situ Biological Reduction	72
7.0 REFERENCES	75

LIST OF TABLES

Table 1 Baseline Soil and Depth-Discrete Groundwater Sampling Protocol	22
Table 2 Biological Reduction Study Effectiveness Monitoring Sampling Protocol	26
Table 3 Chemical Reduction Study Performance Monitoring Sampling Protocol	30
Table 4 Hexavalent Chromium Groundwater Results in Shallow Wells – Biological Reduction Study	34
Table 5 Hexavalent Chromium Groundwater Results in Deep Wells – Biological Reduction Study	36
Table 6 Summary of TOC Groundwater Results in Shallow Wells – Biological Reduction Study	37
Table 7 Summary of TOC Groundwater Results in Deep Wells – Biological Reduction Study	39
Table 8 Summary of Nitrate Groundwater Results in Shallow Wells – Biological Reduction Study	40
Table 9 Summary of Nitrate Groundwater Results in Deep Wells – Biological Reduction Study	41
Table 10 Summary of Chlorate Groundwater Results in Shallow Wells – Biological Reduction Study	42
Table 11 Summary of Chlorate Groundwater Results in Deep Wells – Biological Reduction Study	43
Table 12 Perchlorate Groundwater Results in Shallow Wells – Biological Reduction Study	44
Table 13 Perchlorate Groundwater Results in Deep Wells – Biological Reduction Study	46
Table 14 Chloroform Groundwater Results in Shallow Wells – Biological Reduction Study	47
Table 15 Chloroform Groundwater Results in Deep Wells – Biological Reduction Study	48
Table 16 Summary of Sulfate Groundwater Results in Shallow Wells – Biological Reduction Study	49
Table 17 Summary of Sulfate Groundwater Results in Deep Wells – Biological Reduction Study	50
Table 18 Summary of Dissolved Oxygen Readings in Shallow Wells – Biological Reduction Study	54
Table 19 Summary of Dissolved Oxygen Readings in Deep Wells – Biological Reduction Study	55
Table 20 Summary of Oxidation-Reduction Potential Readings in Shallow Wells – Biological Reduction Study	ı 56
Table 21 Summary of Oxidation-Reduction Potential Readings in Deep Wells – Biological Reduction Study	57
Table 22 Bio-Trap® Results Collected During Baseline Groundwater Monitoring – Biological Reduction Study	59
Table 23 Bio-Trap $^{@}$ Results Collected During PME #5 Groundwater Monitoring – Biological Reduction Study .	60
Table 24 Shallow and Deep Specific Capacity Test Results – Biological Reduction Study	62
Table 25 Deep Slug Test Results – Biological Reduction Study	62
Table 26 Hexavalent Chromium Groundwater Results in Shallow Wells – Chemical Reduction Study	64
Table 27 Hexavalent Chromium Groundwater Results in Intermediate Wells – Chemical Reduction Study	64
Table 28 Hexavalent Chromium Groundwater Results in Deep Wells – Chemical Reduction Study	65
Table 29 Shallow Specific Capacity Test Results – Chemical Reduction Study	67
Table 30 Intermediate and Deep Slug Test Results – Chemical Reduction Study	68
Table 31 In-Situ Chromium Treatability Study Cost Summary	72

LIST OF FIGURES

Figure 1	Site Location Map
Figure 2	Site Layout
Figure 3a	Biological Reduction Study Area Layout
Figure 3b	Biological Reduction Study Area Cross-Section A-A'
Figure 3c	Biological Reduction Study Area Cross-Section B-B'
Figure 4a	Chemical Reduction Study Area Layout
Figure 4b	Chemical Reduction Study Area Cross-Section A-A'
Figure 4c	Chemical Reduction Study Area Cross-Section B-B'
Figure 4d	Chemical Reduction Study Area Cross-Section C-C'
Figure 5a	Groundwater Contours and Flow Direction – Shallow Wells, October 2017 (Biological Reduction Study Area)
Figure 5b	Groundwater Contours and Flow Direction – Deep Wells, October 2017 (Biological Reduction Study Area)
Figure 6a	Groundwater Contours and Flow Direction – Shallow Wells, August 2016 (Chemical Reduction Study Area)
Figure 6b	Groundwater Contours and Flow Direction – Intermediate Wells, August 2016 (Chemical Reduction Study Area)
Figure 6c	Groundwater Contours and Flow Direction – Deep Wells, August 2016 (Chemical Reduction Study Area)
Figure 7a	Hexavalent Chromium, Total Chromium, and Total Organic Carbon Concentrations in Shallow Wells During Biological Reduction Study
Figure 7b	Hexavalent Chromium, Total Chromium, and Total Organic Carbon Concentrations in Deep Wells During Biological Reduction Study
Figure 8a	Perchlorate, Chlorate, Nitrate, and Total Organic Carbon Concentrations in Shallow Wells During Biological Reduction Study
Figure 8b	Perchlorate, Chlorate, Nitrate, and Total Organic Carbon Concentrations in Deep Wells During Biological Reduction Study

APPENDICES

Appendix A UNLV Bench-Scale Report

Appendix B Boring Logs and Well Construction Details

Appendix C Aquifer Testing Results Technical Memorandum

Appendix D Injection Logs

Appendix E Groundwater Monitoring Logs

Appendix F Permits

Appendix G Summary Data Tables

Appendix H Data Validation Summary Report

Appendix I Physical Parameter Laboratory Reports

Appendix J Microbial Analysis Laboratory Reports

LIST OF ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition		
AP Area	ammonium perchlorate manufacturing area		
AP	ammonium perchlorate		
Aquapure 3601®	monosodium orthophosphate		
ASTM	American Society for Testing and Materials		
AWF	Athens Road Well Field		
bgs	below ground surface		
BL	Baseline		
BMI	Basic Management, Inc.		
Cascade	Cascade Technical Services		
COD	chemical oxygen demand		
COPC	chemical of potential concern		
CPS	calcium polysulfide		
Cr(III)	chromium in trivalent state		
Cr(OH) ₃	chromic hydroxide		
Cr(VI)	hexavalent chromium		
DNA	deoxyribonucleic acid		
DO	dissolved oxygen		
EC	electrical conductivity		
EOS _{PRO} ®	Enhanced Emulsified Oil Substrate, a product of EOS® Remediation, LLC		
EPA	U.S. Environmental Protection Agency		
ETI	Envirogen Technologies, Inc.		
EVO	emulsified vegetable oil		
FBR	fluidized bed reactor		
Fe(0)	zero-valent iron		
Fe(II)	ferrous iron		
Fe(III)	ferric iron		
FS	Feasibility Study		
ft/d	feet per day		
ft/ft	feet per foot		
gpm	gallons per minute		
GWETS	Groundwater Extraction and Treatment System		
GWTP	Groundwater Treatment Plant		
H ₂ S	hydrogen sulfide		

Acronyms/Abbreviations	Definition	
H ₂ S _(aq)	aqueous hydrogen sulfide	
HS-	bisulfide	
IDW	investigation-derived waste	
IWF	Interceptor Well Field	
K	conductivity	
kg	kilogram	
kg/m3	kilogram per cubic meter	
L	liter	
m²/g	square meter per gram	
μg/kg	microgram per kilogram	
μg/L	microgram per liter	
μL/min	microliters per minute	
μm	micrometer	
mg/L	milligram per liter	
mL	milliliter	
MS/MSD	Matrix Spike and Matrix Spike Duplicate	
mV	millivolt	
National	National Exploration, Wells and Pumps	
NDEP	Nevada Division of Environmental Protection	
NERT or Trust	Nevada Environmental Response Trust	
NOI	Notice of Intent	
NPDES	National Pollutant Discharge Elimination System	
NS	not sampled	
ORP	oxidation-reduction potential	
PLFA	phospholipid fatty acids	
PME	performance monitoring event	
psi	pounds per square inch	
psig	pounds per square inch gauge	
PVC	polyvinyl chloride	
Qal	Quaternary Alluvium	
RAO	remedial action objectives	
RF2	RF2 Group	
RNA	ribonucleic acid	
rpm	revolutions per minute	
S	storativity	

Acronyms/Abbreviations	Definition
S ²⁻	sulfide
Site	Nevada Environmental Response Trust site
SLMW	stabilized Lake Mead water
SO4 ²⁻	sulfate
SRB	sulfate reducing bacteria
Т	transmissivity
TDS	total dissolved solid
Tetra Tech	Tetra Tech, Inc.
TOC	total organic carbon
UIC	Underground Injection Control
UMCf	Upper Muddy Creek formation
UNLV	University of Nevada at Las Vegas
urea/DAP	urea/diammonium phosphate
VFA	volatile fatty acid
WBZ	water-bearing zone

CERTIFICATION

In-Situ Chromium Treatability Study Results Report

Nevada Environmental Response Trust Site (Former Tronox LLC Site) Henderson, Nevada

Nevada Environmental Response Trust (NERT) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the systems(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee
Signature:, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee
Name: Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee
Title: Solely as President and not individually
Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee
Date: 6/22/18

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances.

June 22, 2018

Date

Description of Services Provided: Prepared In-Situ Chromium Treatability Study Results Report, Nevada Environmental Response Trust Site, Henderson, Nevada.

Kyle Hansen, CEM

Hyled. Hansen

Field Operations Manager/Geologist Tetra Tech, Inc.

Nevada CEM Certificate Number: 2167

Nevada CEM Expiration Date: September 18, 2018

EXECUTIVE SUMMARY

This report summarizes the technical approach and findings for the bench-scale and field treatability studies conducted for in-situ hexavalent chromium reduction in groundwater at the Nevada Environmental Response Trust (NERT or Trust) site (Site) in Henderson, Nevada. The work was performed in accordance with the In-situ Chromium Treatability Study Work Plan, approved by the Nevada Division of Environmental Protection (NDEP) on May 25, 2016. Field treatability studies were performed to separately evaluate biological and chemical reduction of hexavalent chromium. The biological reduction study was performed between November 2016 and October 2017 in the Central Retention Basin. The chemical reduction study was performed between August 2016 and October 2017 within the footprint of the on-going Ammonium Perchlorate (AP) Area Treatability Study, located just west of the AP-5 Pond at the Site.

Bench-Scale Studies

Prior to implementation of the field studies, Tetra Tech contracted with the University of Nevada Las Vegas's (UNLV's) Environmental Engineering and Water Quality Laboratory to conduct laboratory batch microcosm and column in-situ hexavalent chromium reduction studies. Soil and groundwater were collected during well installation activities from both the chemical and biological reduction study areas and transported to UNLV for use in the batch microcosm and column studies. The batch microcosm studies consisted of sets of 125 milliliter (mL) glass bottles filled with the desired amounts of soil, groundwater, and amendments. The bottles were sealed and continuously mixed in a rotary shaker prior to be sampled. The column tests consisted of applying groundwater and selected amendments through 50-inch long, two-inch diameter vertical pipes packed with soil and analyzing the effluent water.

The batch biological reduction microcosm studies were performed to examine the potential for in-situ biological reduction of hexavalent chromium and co-contaminants using various substrates or mixtures of substrates, consisting of emulsified vegetable oil (EVO; specifically EOS_{PRO}®), industrial sugar wastewater, a mixture of EVO and industrial sugar wastewater, and molasses as carbon donors. The feasibility of using various substrates or mixtures of substrates as electron donors was further evaluated using four laboratory-scale column bioreactors, two for the Quaternary Alluvium (Qal) that ran for 160 days and two for the Upper Muddy Creek formation (UMCf) that ran for 165 days. The main objective of the column studies was to demonstrate that hexavalent chromium could be reduced under conditions that simulated field groundwater flow conditions.

The results of the batch biological reduction microcosm and column studies indicated that hexavalent chromium could be reduced by over 99.9% in groundwater and saturated soils at the field biological treatability study area without the need for bioaugmentation. This demonstrates that sufficient indigenous bacteria were present in the groundwater and saturated soils at the field biological treatability study area with the ability to reduce hexavalent chromium and that EOS_{PRO}® and industrial sugar wastewater were effective in reducing hexavalent chromium. A mixture of EOS_{PRO}® and industrial sugar wastewater promoted faster reduction of hexavalent chromium and other co-contaminants than the use of EOS_{PRO}® or industrial sugar wastewater alone. Reduction rates of hexavalent chromium and co-contaminants were slower in the UMCf soils than the Qal soils. Only minor perchlorate degradation was observed through the duration of the microcosm and column studies using the UMCf soils.

The batch chemical reduction microcosm studies were performed to assess the potential for calcium polysulfide (CPS) and ferrous sulfate to reduce hexavalent chromium under conditions that simulated field conditions. Batch tests were conducted with groundwater spiked with a low concentration (500 micrograms per liter $[\mu g/L]$) and a high concentration (10,000 $\mu g/L$) of hexavalent chromium. Based on the results of the batch chemical reduction microcosm studies, column tests were performed with CPS over two stages. During the preliminary stage, two columns were used, one for the Qal and one for the UMCf, with a low concentration of hexavalent chromium in groundwater (1,000 $\mu g/L$) for a period of 36 days. During the second stage, three columns were used, one low

concentration replicate for the Qal (1,000 μ g/L) that ran for 36 days, one low concentration replicate for the UMCf that ran for 34 days, and one high concentration replicate for the UMCf (10,000 μ g/L) that ran for 24 days.

The results of the batch chemical reduction microcosm studies indicated a 99% reduction in hexavalent chromium concentrations in the Qal and UMCf with the use of both CPS and ferrous sulfate. The results of the column studies indicated a 99% reduction in hexavalent chromium concentrations in the Qal and UMCf with the use of CPS. The optimal dosage of CPS was determined to be twice the stoichiometric ratio and the optimal dosage of ferrous sulfate was determined to be five times the stoichiometric ratio. A larger volume of precipitated solids was observed with the use of ferrous sulfate than with the use of CPS.

Field Biological Reduction Treatability Study

The biological reduction treatability study location was east of the Soil Flushing Treatability Test Area in the Central Retention Basin and approximately 640 feet upgradient of the Interceptor Well Field (IWF). The study area consisted of three dual-clustered injection wells and six dual-nested downgradient monitoring wells. Injection wells consisted of three single-completion injection wells screened in the Qal and three single-completion injection wells screened in the UMCf. The six dual-nested monitoring wells were screened separately in the Qal and in the UMCf.

Three separate carbon substrate injection events were conducted to promote in-situ biological reduction of hexavalent chromium. Carbon substrates injected over the three injection events included EOS_{PRO}®, industrial sugar wastewater, granular sugar, and/or molasses. Monosodium orthophosphate (Aquapure 3601®) and a 39% solution urea/diammonium phosphate (urea/DAP) blend were also injected as additional sources of phosphate and nitrogen nutrients. Sodium sulfite and ascorbic acid, both oxygen scavengers, were mixed with the substrate solution to promote anaerobic conditions prior to injecting. Sodium bicarbonate was also mixed with the substrate solution to adjust the pH, as needed. Stabilized Lake Mead Water (SLMW), used as chase/flush water, was injected to enhance the carbon substrate distribution across the injection well network.

Groundwater samples were collected from the injection wells and monitoring wells to establish baseline conditions prior to the injections. Eight performance groundwater monitoring events were conducted between 2 to 24 weeks following the initial injection event. During each performance groundwater monitoring event, water levels were gauged, field parameters were collected, and groundwater samples were collected and analyzed for a variety of laboratory parameters for the downgradient monitoring wells. In addition, Bio-Trap® samplers were deployed in select wells and analyzed for microbial populations during the baseline sampling event and 13 weeks following the initial injection event to evaluate the effect of the carbon substrate injections on the microbial populations. Due to variable hydraulic conductivities reported in the vicinity of the field study area and the relatively limited information available for the UMCf, slug tests were performed for the installed wells to obtain location-specific hydraulic conductivity. Slug tests were conducted in the deep wells screened in the UMCf, however, there was insufficient water in the shallow wells screened in the alluvium to permit slug testing. As a result, specific capacity tests were conducted in the shallow and deep wells, in order to provide supplemental estimates of aquifer parameters, including hydraulic conductivity prior to injection testing. Select wells were also tested after the injection was completed to assess whether hydraulic conductivity was affected by the substrate injections.

The main findings of the biological reduction study are as follows:

- Carbon substrates can be successfully injected into the Qal and UMCf through the use of permanent
 injection wells. For the shallow wells, the average injection flow rates ranged from 1.2 to 4.7 gallons per
 minute (gpm). For the deep wells, the average injection flow rates ranged from 1.3 to 8.6 gpm.
- The biological reduction study demonstrated effective and rapid reduction of hexavalent chromium
 concentrations in groundwater within the Qal. Hexavalent chromium concentrations in groundwater were
 reduced from approximately 11,000 μg/L to below 10 μg/L at four of the six monitoring wells within
 approximately 2 months. The hexavalent chromium concentrations in groundwater at the four monitoring
 wells remained below 10 μg/L through the end of the treatability study, approximately 24 weeks following

the initial injection event. The significant reduction in hexavalent chromium concentrations in groundwater within the Qal during the 24 week monitoring period is largely attributed to the relatively fast groundwater flow velocity and the ability to rapidly create and maintain reducing conditions. The remaining two monitoring wells are located slightly cross-gradient of the groundwater flow direction and are therefore located at the approximate western edge of the treatment zone. The groundwater at these two monitoring wells did not exhibit the same level of influence from the injections as groundwater at the other monitoring wells.

- Although the biological reduction study achieved reductions of hexavalent chromium concentrations in groundwater within the UMCf, these reductions were slower than and not as extensive as in the Qal. At the end of the biological reduction study, approximately 24 weeks following the initial injection event, the concentrations of hexavalent chromium in groundwater were still trending downwards at three downgradient UMCf monitoring wells, all of which also showed influence of carbon injections by an increase in total organic carbon (TOC) concentrations in groundwater during the study. Groundwater at the remaining three UMCf wells did not show evidence of increased TOC concentrations nor reductions in hexavalent chromium concentrations. This difference is likely a result of the tight formation, creating slow and non-uniform groundwater movement and the wells' location near the western edge of the treatment zone.
- The biological reduction study achieved effective reduction of groundwater concentrations of other chemicals of potential concern (COPCs) within the Qal, including perchlorate, chlorate and chloroform. As described above, the rapid movement of groundwater and TOC (i.e., carbon substrate) in the Qal led to the creation of reducing conditions in four of the downgradient monitoring wells. Concentration reductions of greater than 97% were achieved in several of the monitoring wells for perchlorate, chlorate and chloroform within the 24-week treatability study period. As with hexavalent chromium, groundwater at the two monitoring wells located slightly cross-gradient of the groundwater flow direction and at the western edge of the treatment area as evidenced by low TOC concentrations, did not exhibit the same level of influence from the injections as the other monitoring wells. Nevertheless, these wells provided valuable information related to the cross gradient distribution of the of carbon substrate in groundwater for use in the Feasibility Study (FS) and design of a potential full-scale remedy.
- The biological reduction study also demonstrated some reductions of chlorate and chloroform concentrations in groundwater within the UMCf. However, these reductions were not as rapid nor as extensive as for the Qal. At the end of the biological reduction study, the concentrations of chlorate in groundwater were still trending downwards in three UMCf monitoring wells, which also showed influence of increased TOC concentrations from the study. Although no reductions in perchlorate concentrations were observed in groundwater within the monitoring wells within the UMCf during the study timeframe, it is anticipated the perchlorate and chloroform concentrations in groundwater would decrease following hexavalent chromium, nitrate, and chlorate degradation, which began occurring towards the end of the study. Groundwater at the remaining three monitoring wells did not show increased TOC concentrations and did not exhibit reduction of chlorate, perchlorate, or chloroform, likely due to the tight formation and the wells' location at the western edge of the treatment area.
- Dissolved metal concentrations in groundwater such as arsenic, iron, and manganese increased at several downgradient monitoring wells during the biological reduction study; however, the increases are spatially limited to the monitoring wells located within the treatability study area and concentrations are expected to return to baseline concentrations downgradient and within the treatment zone as the geochemical conditions return to baseline conditions.

Field Chemical Reduction Treatability Study

The chemical reduction study is located in the AP Area Up and Down Flushing Treatability Study area, west of the AP-5 Pond and approximately 175 feet upgradient of the IWF. The chemical reduction study utilized the injection and monitoring wells installed as part of the AP Area Up and Down Flushing Treatability Study. Injection and

monitoring wells are dispersed over two soil flushing plots (Plot 1 and 2). Each plot contains four triple cluster single-completion injection wells and three triple nested monitoring wells. Each triple-cluster or triple-nested injection and monitoring well consisted of shallow wells (screened in the Qal just above the Qal/UMCf contact), intermediate wells (screened in the UMCf, just below the Qal/UMCf contact), and deep wells (screened in the UMCf around 15 feet below the Qal/UMCf contact). The chemical reduction study consisted of one chemical injection event conducted between August 7 and August 8, 2017 that included a total of 600 gallons of a CPS solution, comprised of 60 gallons of CPS and 540 gallons of SLMW. The injectate solution was injected across the shallow and intermediate injection wells associated with Plots 1 and 2 in the AP Area Up and Down Flushing Treatability Study area. Additionally, a total of 3,910 gallons of SLMW used as chase/flush water was injected to enhance subsurface distribution. No injections were performed in the deep injection wells so they could be used to monitor the potential vertical migration of contaminants from injections into the intermediate injection wells.

The main findings of the chemical reduction study are as follows:

- Calcium polysulfide (10% solution by weight) can be successfully injected into the Qal and UMCf through the use of permanent injection wells. Within the Qal, injection flow rates ranged from 4.5 to 4.6 gpm.
 Within the UMCf, injection flow rates ranged from 4.1 to 5.6 gpm.
- The chemical reduction study evaluated hexavalent chromium reduction in the Qal and UMCf. Within the UMCf, hexavalent chromium concentrations were reduced by 67% to 99% in groundwater at five of the six intermediate monitoring wells when compared to baseline concentrations. Within the Qal, hexavalent chromium concentrations were reduced in groundwater at only one of the six shallow monitoring wells when compared to baseline concentrations. The limited reduction in hexavalent chromium concentrations in groundwater within the Qal is largely attributed to the limited saturated thickness present in the Qal, with three of the six shallow monitoring wells going dry by the final sampling event conducted in October 2017, as well as low baseline groundwater concentrations.

Conclusions and Recommendations

The following is a summary of the general conclusions and recommendations for the in-situ chromium treatability study and for the implementation of in-situ chromium remediation at the Site:

- In-situ treatment by biological reduction has been shown to be effective at reducing the concentrations of hexavalent chromium and other COPCs in groundwater within the Qal, and to a lesser extent in groundwater within the UMCf.
- A combination of water-soluble and slow-release carbon substrates including industrial sugar wastewater, granular sugar, EOS_{PRO}[®], and molasses was successfully applied to create a sustained reducing environment in the Qal and to a lesser extent in the UMCf, which is required for hexavalent chromium reduction. Each carbon substrate has its advantages and disadvantages, which can be mitigated by combining substrates or through other amendments. The selection of the carbon substrate(s) used for future implementation should take into consideration the availability and cost of the carbon substrate, lithology and hydrology of the target formation, and intended longevity in the subsurface.
- The use of biological reduction is recommended over chemical reduction based on overall effectiveness and the ability to concurrently treat other COPCs, such as chlorate, perchlorate, nitrate, and chloroform.
- Nitrate and phosphate concentrations should be carefully monitored and supplemented if necessary to
 assist in maintaining the microbial populations necessary for biological reduction of other COPCs, such
 as chlorate, perchlorate, and chloroform.
- The use of oxygen scavengers (e.g., sodium sulfite, ascorbic acid) and buffering amendments (e.g., sodium bicarbonate) is recommended, as necessary, to minimize the impact of the injectate on the microbial populations. For instance, the low pH of the industrial sugar wastewater was mitigated through the addition of sodium bicarbonate to the injection solution to increase the pH and counteract the potential pH shock to the microbial populations.

- TOC should be carefully monitored to ensure an adequate amount of carbon substrate is present to maintain microbial growth, while not providing excess carbon substrate which could induce over-accumulation of biomass and reduction of permeability in the surrounding formation. Reduction in permeability in the surrounding formation was not a problem during the treatability study as demonstrated by the limited reduction in hydraulic conductivity and ability to inject carbon substrates over three separate injection events without observable trends of decreased injection flow rates or increased injection pressures.
- Additional groundwater monitoring is recommended for the biological reduction study. Due to the slow groundwater velocity in the UMCf, the influence from the carbon substrate injections were beginning to be observed in groundwater at the nearest downgradient groundwater monitoring wells after a substantial period of time, approximately 24 weeks following the initial injection event, as evidenced by the increase in TOC concentrations and decrease in hexavalent chromium, nitrate, and chlorate concentrations. However, complete reduction of hexavalent chromium and other COPCs were not observed. Collecting additional groundwater monitoring data will help finalize the evaluation of groundwater velocity, carbon substrate longevity, the degree to which reduction of hexavalent chromium and other COPCs could occur in groundwater within the UMCf, and confirm geochemical conditions return to baseline conditions.

The results of this in-situ chromium treatability study will be ultimately incorporated into the FS to be prepared by NERT following completion of the Remedial Investigation. The evaluation of the applicable remedial action alternatives completed in the FS will consider the findings of this treatability study, as well as any others conducted, to prepare NERT's recommendation for remedial action alternatives to address Henderson legacy conditions.

1.0 INTRODUCTION

On behalf of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this *In-Situ Chromium Treatability Study Results Report* for the NERT site (Site), located in Clark County, Nevada (Figure 1). This report is being submitted to the Nevada Division of Environmental Protection (NDEP) pursuant to the Interim Consent Agreement between NERT and NDEP effective February 14, 2011. This report presents a summary of the technical approach and an evaluation of the results for the bench-scale and field treatability studies conducted for hexavalent chromium reduction in groundwater. The treatability study was implemented consistent with the approved *In-Situ Chromium Treatability Study Work Plan* (Tetra Tech, Inc., 2016a).

The In-Situ Chromium Treatability Study included bench-scale studies that were performed by the University of Nevada at Las Vegas (UNLV) to evaluate several chemicals and biological carbon substrates for remediation of hexavalent chromium. After the completion of the bench-scale studies, the selected biological carbon substrates were injected as part of a biological reduction field treatability study that was performed in the Central Retention Basin at the Site, located approximately 640 feet upgradient of the Interceptor Well Field (IWF) (Figure 1). A chemical reduction field study was also performed between August 2016 and October 2017 concurrent with the Ammonium Perchlorate (AP) Area Up and Down Flushing Treatability Study, located just west of the AP-5 Pond at the Site. The results of the chromium reduction study are included in this *In-Situ Chromium Treatability Study Results Report*.

1.1 OBJECTIVE

The primary objective of the in-situ chromium treatability study was to evaluate the feasibility of achieving in-situ reduction of hexavalent chromium in groundwater at the Site using biological and chemical reduction processes. The results of this treatability study will also provide insights for the Unit 4 Source Area In-Situ Bioremediation Treatability Study that will be addressing chemicals of potential concern (COPCs) at depth in the Upper Muddy Creek formation (UMCf) near the former sodium perchlorate manufacturing area.

1.2 SITE DESCRIPTION

The Site has been used for industrial purposes since 1942, when it was initially developed by the United States government as a magnesium plant to support World War II operations. Since that time, the Site and the surrounding properties have been used for chemical manufacturing, including the production of various chlorate and perchlorate compounds. Entities that operated at the Site include Western Electrochemical Company, American Potash and Chemical Company, Kerr-McGee Chemical Corporation, and Tronox Incorporated. On February 14, 2011, NERT took title to the Site as part of the settlement of the Tronox Incorporated Chapter 11 bankruptcy proceedings. As part of a long-term lease, Tronox Limited (Tronox) operates a manufacturing facility on 114 acres of the Site producing manganese and boron products. Historical industrial production and related waste management activities conducted at the Site and on adjacent properties have resulted in the contamination of various environmental media, including soil, groundwater, and surface water. The most notable Site-related COPCs are chromium and perchlorate (Ramboll Environ, 2015).

Groundwater extraction has been implemented at the Site to address impacts to groundwater resulting from releases of perchlorate and hexavalent chromium. Collectively, the entire system of extraction wells, water conveyances, and treatment plants is referred to as the Groundwater Extraction and Treatment System (GWETS). The GWETS treats water from three groundwater extraction well fields: the IWF; the Athens Road Well Field (AWF); and the Seep Well Field. The Groundwater Treatment Plant (GWTP) removes chromium from groundwater and has been treating IWF-extracted groundwater since its construction in 1986-87.

The chromium-impacted groundwater extracted by the IWF is treated by first chemically reducing the hexavalent chromium by adding ferrous sulfate and then removing the resulting trivalent chromium through chemical precipitation. The precipitated solids settle in a clarifier and are pumped periodically into a filter press where a final sludge cake is produced and disposed of off-site. The treated groundwater effluent is pumped to either the GW-11 Pond or the equalization tanks before it enters the fluidized bed reactor (FBR) biological treatment plant (Ramboll Environ, 2017).

1.2.1 Biological Reduction Study Area

The Central Retention Basin is located approximately 640 feet south (upgradient) of the IWF and contains the locations of the former Beta Ditch and Beta Ditch Extension. The Beta Ditch was an unlined ditch constructed around 1941-1942 to receive several waste streams from various process operations at the Site. In addition, the Beta Ditch received storm water and non-contact cooling water (Ramboll Environ, 2016). The Beta Ditch was used to convey these liquids into the Upper and Lower Basic Management, Inc. (BMI) ponds. In 1970, the Beta Ditch Extension was constructed to extend accessibility of the Beta Ditch to chemical manufacturers located on the west side of the industrial complex. The Beta Ditch and Beta Ditch Extension were excavated during the 2010-2011 Interim Soil Removal Excavation at the Site and were graded to construct what is now currently the Central Retention Basin. The Central Retention Basin was constructed in order to retain storm water on-Site and is connected to another storm water retention basin, the Northern Retention Basin, via a shallow channel located along the eastern edge of the Site. The Northern Retention Basin is located approximately 300 feet north (downgradient) of the IWF and was also constructed during the 2010-2011 soil excavation activities (Ramboll Environ, 2016). The Central Retention Basin contains monitoring wells and former boring locations associated with site investigation activities, the former soil flushing test plots and monitoring wells constructed as part of the Soil Flushing Treatability Study. This area was selected for the In-Situ Chromium Treatability Study biological reduction field study based on the expected presence of high hexavalent chromium concentrations in groundwater and the fact the study area was located approximately 640 feet upgradient of the IWF, which minimized the potential for biofouling the IWF extraction wells (Figures 1 and 2).

1.2.2 Chemical Reduction Study Area

The former AP Area is located just north of the Central Retention Basin. Currently, a portion of the AP Area is being used for the ongoing AP Area Up and Down Flushing Treatability Study which features soil flushing plots in addition to injection wells, monitoring wells, and extraction wells. The injection wells and monitoring wells associated with the AP Area Up and Down Flushing Treatability Study were used for the chemical reduction field study conducted as part of this In-Situ Chromium Treatability Study. The location of the chemical reduction field study, within the AP Area Up and Down Flushing Treatability Study area (Figures 1 and 2), was selected based on the presence of existing data and an existing injection and monitoring well network that could be utilized for implementing the study.

1.2.3 Regional Geology

The Site is located at the southeast end of the Las Vegas Valley, a 55-mile long northwest-southeast trending structural basin that is bounded on the west by the Spring Mountains, on the north by the southern ends of the Sheep and Las Vegas Ranges, on the east by Frenchman and Sunrise Mountains, and on the south by the River Mountains and McCullough Range. The Las Vegas Valley is underlain by a structural basin comprised of Precambrian crystalline rocks; Precambrian and Paleozoic carbonate rocks; Permian, Triassic, and Jurassic clastic rocks; and Miocene igneous rocks (Plume, 1989).

The clastic sedimentary valley-fill deposits of Las Vegas Valley are more than 4,000 feet thick beneath Henderson, Nevada (Plume, 1989). The lithology of the top 250 feet consists of Qal deposits, transitional Muddy Creek Formation, and Pleistocene UMCf (ENVIRON, 2014a).

1.2.3.1 Alluvium

The Site is immediately underlain by Qal deposits that slope to the north toward the Las Vegas Wash. The alluvium generally consists of a reddish-brown heterogeneous mixture of well-graded sand and gravel with lesser amounts of silt, clay, and caliche. Beds or units observed in the area are typically discontinuous due to the mode of deposition. Cobbles and boulders are common, and clasts within the alluvium are primarily composed of volcanic material. The thickness of these alluvial deposits ranges from less than 1 foot to more than 50 feet.

Several known major paleochannels transect the region, from as far south as the Site, towards the Las Vegas Wash. These paleochannels were eroded into the surface of the Muddy Creek Formation during infrequent flood runoff periods with stream-deposited sands and gravels. The generally uniform sand and gravel deposits are narrow, vary in thickness, and exhibit higher permeability than the adjacent well-graded deposits (ENVIRON, 2014a).

1.2.3.2 Muddy Creek Formation

The Muddy Creek Formation represents deposition in an alluvial apron environment from the Spring Mountains to the west, grading into fluvial, paludal (swamp), playa, and lacustrine environments farther out into the valley center (ENVIRON, 2014a). The UMCf underlies the alluvium, and consists of interbedded fine-grained sediments (clay and silt representing the first and second fine-grained facies) and coarse-grained materials (sand, silt, and gravel representing the first and second coarse-grained facies) that become progressively finer-grained to the north towards the central portion of the Las Vegas Valley.

1.2.4 Hydrogeology

According to previous work performed around the region, the depth to groundwater ranges from approximately 27 to 80 feet bgs, is generally deepest in the southern portion of the Site, and becomes shallower to the north toward the Las Vegas Wash. The average groundwater gradient ranges from 0.015 to 0.020 feet per foot (ft/ft), south of the AWF, and decreases to approximately 0.007 to 0.010 ft/ft to the north of the AWF (ENVIRON, 2014a). The direction of groundwater flow on the Site is generally north to north-northwest and then changes slightly to the northeast towards the Las Vegas Wash.

The NDEP has defined the following three water-bearing zones (WBZs) that occur within the Site:

- Shallow WBZ The first occurrence of groundwater in the area occurs within either the Qal or the UMCf.
 Groundwater in the Shallow WBZ occurs under unconfined to partially confined conditions and is
 considered the "water table aquifer." At the Site, the Shallow WBZ is comprised of the saturated portions
 of the alluvium and the uppermost portion of the UMCf to depths of approximately 90 feet bgs (ENVIRON,
 2014a).
- Middle WBZ Groundwater in the Middle WBZ generally occurs between 90 and 300 feet bgs. Waterbearing units in the Middle WBZ are confined (ENVIRON, 2014a). Groundwater in the Middle WBZ exhibits an upward vertical gradient (Ramboll Environ, 2015).
- Deep WBZ Groundwater in the Deep WBZ generally occurs between 300 and 400 feet bgs. Water-bearing units in Deep WBZ are confined. Groundwater in the Deep WBZ exhibits an upward vertical gradient (Ramboll Environ, 2015).

1.2.5 Extent of Chromium Impacts

Since the early 1980s, subsurface investigations have identified chromium impacts in groundwater north of the Unit Buildings and extending as far north as the City of Henderson Bird Viewing Preserve. The highest concentrations of chromium in groundwater at the Site have been historically reported south (upgradient) of the IWF and the barrier wall. NDEP identified 70 contaminant source areas for the Site, including process chemicals suspected to have leaked to soil through cracks in the basements of Units 4, 5, and 6 (ENVIRON, 2014a).

In the most recent *Annual Remedial Performance Report for Chromium and Perchlorate* dated December 8, 2017, the maximum total chromium concentrations in groundwater were reported in monitoring wells M-65 and M-66 (16 and 15 milligrams per liter [mg/L], respectively) and in extraction wells I-G, I-T, and I-U (ranging from 21 to 23 mg/L) (Ramboll Environ, 2017). Immediately upgradient of the IWF, chromium appears to primarily be in the hexavalent state with a maximum hexavalent chromium concentration of 11 mg/L in groundwater at M-38 (total chromium concentration reported as 13 mg/L). While these wells are screened across both the alluvium and UMCf, groundwater elevations at most of these monitoring and extraction wells are below the UMCf contact (M-65, I-G, I-T, and I-U), indicating significant hexavalent chromium concentrations are present within the UMCf. Additionally, as presented in Table 11 of the *Annual Remedial Performance Report* dated December 8, 2017, it is estimated that approximately 98.5% of the chromium mass on-Site is currently present in the UMCf with only 1.5% present within the alluvium (Ramboll Environ, 2017).

1.3 REPORT ORGANIZATION

The report is organized as follows:

- **Introduction (Section 1.0):** Provides the primary objectives of this treatability study and the organization of this report.
- Technology Description (Section 2.0): Provides an overview of biological and chemical reduction of hexavalent chromium.
- Laboratory Bench-Scale Studies (Section 3.0): Presents the objectives, procedures, and results of the laboratory bench-scale microcosm and column studies conducted at UNLV.
- Field Treatability Study Activities (Section 4.0): Provides a summary of field treatability study activities including the study area locations and layout, injection and monitoring well installations, injection events, effectiveness monitoring program, and permitting requirements for the treatability study.
- Analysis of Results (Section 5.0): Summarizes results for analytical soil and groundwater data, including geochemical and field parameters, and provides an evaluation of effectiveness for biological and chemical reduction of hexavalent chromium and other COPCs.
- Summary of Key Findings (Section 6.0): Summarizes the overall findings of the treatability study and
 provides considerations for both cost and large-scale implementation of chromium reduction at the NERT
 site
- References (Section 7.0): Lists the documents referenced in this report.

2.0 TECHNOLOGY DESCRIPTION

This treatability study evaluated the use of biological substrates and chemicals for the in-situ reduction of hexavalent chromium in groundwater at the Site. A brief discussion of the biological and chemical reduction technologies are provided in the following sections. The three carbon substrates used in the bench-scale tests and field biological reduction treatability study are discussed in the subsections following the general discussion of the biological reduction technology.

2.1 BIOLOGICIAL REDUCTION

In-situ microbial reduction of hexavalent chromium [Cr(VI)] to its trivalent state [Cr(III)] can be enhanced by injecting a carbon substrate solution. The carbon substrate is readily degraded by heterotrophic microorganisms present in the aquifer. This process depletes the available dissolved oxygen and causes reducing conditions within the aquifer. Various mechanisms for conversion of Cr(VI) to Cr(III) include: (1) the direct enzymatic reduction of Cr(VI) by numerous bacteria species, such as *Bacillus subtilis* (Fredrickson, Kostandarithes, Li, Plymale, & Daly, 2000; Lovely, 1993; Lovely & Coates, 1997; Tebo & Obraztsova, 1998); (2) an extracellular reaction with by-products of sulfate reduction such as hydrogen sulfide (H₂S); and (3) abiotic oxidation of the organic compounds including soil organic matter such as humic and fulvic acids. Microbial reduction of Cr(VI) primarily occurs under anaerobic conditions. In addition, microbial reduction of ferric iron [Fe(III)] and sulfate (SO4²⁻) creates chemical reductants, ferrous iron [Fe(II)] and sulfide (S²⁻) respectively, which can reduce Cr(VI) to Cr(III) (Fendorf, Hansel, & Wielinga, 2002; Wielinga, Mizuba, Hansel, & Fendorf, 2001).

As shown in the following chemical equation, the primary end product of hexavalent chromium reduction is chromic hydroxide [Cr(OH)₃], which readily precipitates out of solution under moderately acidic and alkaline conditions:

Carbon Substrate +
$$4 \text{ CrO}_4^{2-}$$
 + $8 \text{ H}^+ \rightarrow 3 \text{ CO}_2$ + 4 Cr(OH)_3 + H_2

The chromium precipitates remain immobilized within the soil matrix of the aquifer, ensuring short-term and long-term effectiveness (Sass & Rai, 1987; Pettine, D'ottone, Campanella, Millero, & Passino, 1998).

Adding a carbon substrate to the subsurface can sustain the appropriate redox range (approximately -200 to -300 millivolts [mV]) in aquifers with limited supply of natural organic carbon. Numerous carbon donors are available and the selection is based on several physical, chemical, geochemical, and economic factors. At the Site, the objective is to examine the feasibility of biological reduction, which requires the engineered addition of a carbon substrate to the groundwater to optimize and sustain in-situ biodegradation of hexavalent chromium in groundwater.

Previous bench-scale testing for the Site at UNLV have demonstrated that the sequence of biological degradation is:

chromium > nitrate > chlorate > perchlorate

The presence of high total dissolved solids (TDS) could inhibit perchlorate reducing microorganisms. The biodegradation of chloroform can occur through co-metabolism or through bacteria using chloroform as a terminal electron acceptor (Capppelletti, Frascari, Zannoni, & Fedi, 2012). Chloroform degradation typically does not occur under denitrifying conditions (Bouwer & McCarty, 1983). Therefore, at the NERT site, chloroform degradation would be expected to occur after denitrification under reducing conditions. Bench-scale testing planned for the Unit 4 Source Area In-situ Bioremediation Treatability Study will further evaluate this sequence and how the biodegradation of chloroform fits into the sequence.

2.1.1 Emulsified Vegetable Oil

Emulsified vegetable oil is prepared by mixing edible oils with emulsifying agents and water, yielding a smooth blended oil-in-water emulsion. The small, uniform emulsion droplets can transport in most aquifers and have a negative surface charge to reduce droplet capture by the solid surfaces (Solutions-IES, Inc., 2006). Oil droplets can collide with sediment surfaces and coat them with a thin layer of oil droplets when they migrate through the aquifer pore spaces, which provides a carbon source for long-term biodegradation. A single injection can provide sufficient carbon to drive biodegradation for several months, which can help lower operational and maintenance costs. The small oil droplets of emulsified vegetable oil can be transported substantial distances (up to 45 feet depending on the geological conditions) with low to moderate oil retention and little permeability loss. Therefore, the major advantage of these carbon substrates is their longevity in the subsurface and less frequent injection intervals.

EVO may be formulated to include a mixture of fast-release carbon substrates, such as glycerin and/or or sugars, with the slow release emulsified vegetable oil. An example of such a mixture is EOS_{PRO}®, a product of EOS® Remediation, LLC. EOS_{PRO}® has previously been evaluated for the Site and was successfully applied during the Groundwater Bioremediation Treatability Study located approximately 2,000 feet downgradient of the AWF (Tetra Tech, Inc., 2016b). Results of this study indicated that the injection of EOS_{PRO}® provided a sustained reducing environment that is required for perchlorate biodegradation in groundwater and was effective at reducing perchlorate concentrations in groundwater by greater than 90% in many downgradient monitoring wells. Therefore, EOS_{PRO}® was used in the bench-scale and biological reduction field treatability study.

2.1.2 Industrial Sugar Wastewater

As the cost of the carbon substrate is one of the primary costs for implementing biological reduction, finding a cost-effective, local supply of carbon substrate is preferable. A facility located in the general vicinity of the Site manufactures consumer fruit juice and generates a substantial quantity of fruit juice that does not meet quality standards for distribution and rinse water used to clean juice lines. In 2015, UNLV analyzed a representative sample of the solution, which the facility discharges under permit to the sanitary sewer. UNLV determined that it had a chemical oxygen demand (COD) of 26,880 mg/L, a pH of 5.5 standard units, and ammonia concentration of 10 mg/L as nitrogen. While the pH of the solution is slightly acidic, sodium bicarbonate can easily be added to increase the pH if required. This reclaimed industrial sugar wastewater was used in the bench-scale and biological reduction study to evaluate its effectiveness as a carbon substrate.

2.1.3 Molasses

Molasses is a viscous by-product of the refining of sugarcane or sugar beets into sugar. It has been used for remediation of hexavalent chromium in groundwater for over 20 years with a relatively high degree of success. Molasses is a water-soluble carbon substrate that provides an electron donor and carbon source for native bacteria present in the aquifer. The increased activity of the bacteria will rapidly utilize any dissolved oxygen and any other electron acceptors present in the groundwater, driving conditions to be anaerobic and causing hexavalent chromium to be reduced to trivalent chromium (Chen, Zhao, & Bai, 2015). The trivalent chromium precipitates out of the groundwater as chromium hydroxide and remains as part of the soil matrix. The advantage of this soluble carbon substrate is that it is a low-cost alternative, food-grade, and easy to handle and use. However, molasses also has a shorter half-life, can alter the groundwater pH, and may require multiple rounds of injections depending on the groundwater conditions. Blackstrap molasses was used in the bench-scale and biological reduction field study due to the additional nutrients present that help promote biological growth.

2.2 CHEMICAL REDUCTION

Chemical reduction of Cr(VI) to Cr(III) refers to abiotic reduction via an electron donor such as sulfur, or iron (as Fe(II) or zero-valent iron [Fe(0)]). From this reduction, Cr(III) precipitates out of solution and Cr(VI) toxicity is

reduced. Examples of engineered chemical reduction technologies include in-situ injection of an electron donor such as calcium polysulfide (CPS), ferrous sulfate, and other sulfate-based reductants. During injection, the pH level is optimized to facilitate electrostatic surface interactions between the Cr(VI) anionic species and the electron donor. In areas that exhibit high Cr(VI) concentrations, pH is increased so that Cr(III) forms precipitates (Guertin, Jacobs, & Avakian, 2005). While numerous chemicals are capable of achieving chemical reduction of Cr(VI) to Cr(III), CPS was selected for further evaluation due to its relative ease of use, availability, documented effectiveness, and relative costs. Ferrous sulfate was also considered and incorporated into the laboratory bench-scale studies, but based on the preliminary bench-scale results, was not selected for the chemical reduction field study.

CPS is used extensively as an agricultural soil amendment, a fungicide at vineyards, and for removal of metals in water treatment systems (Padzadeh & Batista, 2011). It has more recently been found to be capable of fixating many heavy metals (e.g., arsenic, lead, copper, cadmium) in the environment. There have been numerous successful applications of CPS to treat Cr(VI) in groundwater over the last 15 years (Freedman, Lehmicke, & Verce, 2005; Graham, et al., 2006; Storch, Messer, Palmer, & Pyrih, 2002; Messer, Storch, & Palmer, 2003; Yu & Tremaine, 2002) at industrial sites with Cr(VI) concentrations as high as 240 mg/L (Blessing & Rouse, 2002).

Once CPS is mixed with water, polysulfide dissociates to form bisulfide (HS-) and aqueous hydrogen sulfide (H $_2$ S_(aq)), which can react directly with Cr(VI) to form Cr(III). Alternatively, the sulfide can reduce Fe(III) present in the aquifer to Fe(II), which reduces Cr(VI) to Cr(III). In the pH range of 4 to 10, Cr(III) will precipitate as Cr(OH) $_3$. If reduction is by Fe(II), Cr(III) will co-precipitate with Fe(III) to form the less soluble Fe $_{0.75}$ Cr $_{0.25}$ (OH) $_3$ (Sass & D. Rai, 1987). In summary, calcium polysulfide can reduce Cr(VI) to Cr(III) to form a non-toxic, low solubility form of chromium, chromium hydroxide, as generally described by the following chemical equation:

$$2 \text{ CrO}_4^{2-} + 3 \text{ CaS}_5 + 10 \text{ H}^+ --> 2 \text{ Cr(OH)}_3 + 15 \text{ S} + 3 \text{ Ca}^{2+} + 2\text{H}_2\text{O}$$

CPS is typically more stable and persistent in groundwater than other reductants and is relatively safe to handle. CPS and ferrous sulfate were both evaluated as part of the laboratory bench-scale studies to evaluate dosage and expected treatment times, and to select the preferred chemical for use in the chemical reduction study.

3.0 LABORATORY BENCH-SCALE STUDIES

Prior to implementation of the field studies, Tetra Tech contracted UNLV's Environmental Engineering and Water Quality Laboratory to conduct laboratory batch microcosm and column studies to evaluate in-situ hexavalent chromium reduction. The primary goal of the batch microcosm and column studies was to evaluate proposed amendments for injection into the saturated zone with regard to promoting hexavalent chromium reduction under site-specific conditions. This section summarizes the objectives, general setup/procedures, and brief findings, conclusions, and recommendations drawn from the bench-scale studies. Appendix A provides the final UNLV report, Bench-Scale Investigation: Chemical and Biological Reduction of Hexavalent Chromium and Co-Contaminants at the Interceptor Well Field (IWF) of the NERT Site, Henderson, Nevada (referred to herein as the final UNLV laboratory report), which presents the details of the experimental approach, data, and analysis of results.

3.1 BENCH-SCALE OBJECTIVES

As described in the *In-Situ Chromium Treatability Study Work Plan*, the objectives of the bench-scale studies were to accomplish the following:

- Determine the most appropriate chemical and biological carbon substrate amendments to promote the reduction of hexavalent chromium under site-specific conditions;
- Evaluate chemical and biological carbon substrate dosage;
- Determine chemical and biological carbon substrate persistence;
- Evaluate impact of chemical and carbon substrate type on degradation kinetics; and
- Evaluate impact of pH on degradation kinetics.

3.2 COLLECTION AND EVALUATION OF SOIL AND GROUNDWATER

Soil used in the laboratory bench-scale studies was obtained as cuttings and soil cores from two newly drilled monitoring wells in the biological reduction study area (CTMW-03S and CTMW-03D; Figure 3a) and three newly drilled injection wells in the chemical reduction study area (UFIW-02S, UFIW-02I, and UFIW-02D; Figure 4a). Soil samples were collected by Tetra Tech in sterile plastic buckets with sterile hand shovels from the following intervals:

- Qal: 18 to 23 feet bgs from CTMW-03S
- Qal: 23 to 28 feet bgs from UFIW-02S
- UMCf: 31 to 36 feet bgs from UFIW-02I
- UMCf: 33 to 38 feet bgs from CTMW-03D
- UMCf: 43 to 48 feet bgs from UFIW-02D

Approximately four gallons of soil cuttings (two 2-gallon buckets) were collected from each 5-foot drilling interval. Soil from each sampling interval was blended in the laboratory and used for both batch microcosm and column studies. Soil collected from the chemical reduction study area was used for the chemical batch microcosm and column studies. Soil collected from the biological reduction study area was used for the biological batch microcosm and column studies. Groundwater samples for the chemical batch microcosm and column studies were collected from wells UFIW-06S (screened from 25 to 30 feet bgs) and UFIW-06I (screened from 35 to 40 feet bgs) at the start of the study and periodically thereafter during the column studies. During later studies, groundwater samples were also collected from UFIW-03S (screened from 19 to 24 feet bgs). Groundwater samples for the biological batch microcosm and column studies were collected from CTMW-03S (screened from

19 to 24 feet bgs) and CTIW-01D (screened from 33 to 38 feet bgs). UNLV analyzed the soil samples for moisture content, grain size distribution, and contaminant concentrations.

3.3 BIOLOGICAL REDUCTION STUDIES

The experimental methodology and results of biological reduction batch microcosm and column studies performed by UNLV are described in this subsection.

3.3.1 Batch Microcosm Studies

The batch microcosm studies were performed to examine the potential for in-situ biological reduction of hexavalent chromium and co-contaminants using various substrates or mixtures of substrates, consisting of EOS_{PRO®}, industrial sugar wastewater, a mixture of EVO and industrial sugar wastewater, and molasses as carbon donors.

3.3.1.1 Microcosm Setup and Effectiveness Monitoring

All microcosm studies were performed using 125 milliliter (mL) autoclave-sterilized borosilicate glass bottles. The final UNLV laboratory report in Appendix A describes in detail the various setups. Each bottle was filled with the desired amounts of soil, groundwater, carbon substrate, and any supplements (e.g., nutrients such as phosphate). The estimated initial COD added to all microcosms was 12,000 mg/L, either as EVO, industrial sugar wastewater, a mixture of EVO and industrial sugar wastewater, or molasses. The microcosm bottles were crimped closed using butyl rubber caps and aluminum rings to ensure anaerobic/anoxic conditions, and were continuously mixed in a rotary shaker at 30 revolutions per minute (rpm) at room temperature. All studies were performed in duplicate. At pre-determined time intervals, one bottle and its duplicate were removed for analysis, unless specified. The microcosm bottles were taken out of the rotor and were left to settle for at least 6 to 8 hours. The liquid was decanted and filtered through a 0.2 micrometer (µm) sterile filter. The samples were analyzed for hexavalent chromium, nitrate, perchlorate, chlorate, and COD (Appendix A).

3.3.1.2 Results

The key results and findings from the batch biological reduction microcosm studies include the following:

- EVO and industrial sugar wastewater were effective in supporting hexavalent chromium reduction.
- Industrial sugar wastewater or a mixture of EVO and industrial sugar wastewater promoted faster reduction rates of hexavalent chromium than the use of EVO alone.
- The use of industrial sugar wastewater alone was not preferred by bacteria to reduce nitrate, chlorate, and perchlorate.
- Reduction rates of hexavalent chromium, nitrate, chlorate, and perchlorate were slower in the UMCf
 microcosms than the Qal regardless of the substrate used. This is largely attributed to the difference in
 soil properties and varying acclimation times for the indigenous bacteria present in the Qal compared to
 the UMCf.
- The addition of ammonium phosphate to a mixture of EVO and industrial sugar wastewater promoted faster reduction rates than a mixture of EVO and industrial sugar wastewater without ammonium phosphate.
- Batch microcosm studies demonstrated that sufficient indigenous bacteria, with the ability reduce hexavalent chromium, were present in groundwater and saturated soils at the treatability study area.
- The elevated TDS concentrations in Site groundwater did not appear to have an effect on hexavalent chromium reduction rate, but is a potential factor in the reduction rate of perchlorate, nitrate, and chlorate.

- Because of the high nitrate concentrations in groundwater (ranging from above 600 mg/L in the Qal and 200 mg/L in the UMCf), it was not necessary to augment the system with nitrogen micronutrients.
- The nitrate concentration in the Qal was approximately three times that of the UMCf, and significant chlorate degradation only occurred after nitrate was significantly degraded.
- Only minor perchlorate degradation was observed in both the Qal and UMCf microcosms during the term of the microcosm studies.
- The pH resulting from the addition of industrial sugar wastewater, EVO, or a mixture of both substrates ranged from 6.5 to 7.5, within the favorable range for in-situ biological reduction, and did not appear to have had a major impact on degradation kinetics.

3.3.2 Biological Reduction Column Studies

The feasibility of using various substrates or mixtures of substrates (specified in Section 3.3.1) as electron donors for in-situ biological reduction of hexavalent chromium and co-contaminants was evaluated using four laboratory-scale column bioreactors, two for the Qal and two for the UMCf. The column bioreactors were designed to evaluate treatment of hexavalent chromium-contaminated groundwater obtained from the Site, such that the flow rates were comparable to the groundwater flow rates at the Site. The main objective of the column studies was to demonstrate that hexavalent chromium could be reduced under conditions that simulated field groundwater flow conditions in both the Qal and UMCf.

3.3.2.1 Column Setup and Effectiveness Monitoring

A total of four columns, two for the Qal and two for the UMCf, were filled with packed soil from the cuttings produced during the drilling of UFIW-02S and CTMW-03D to simulate groundwater velocities within the Qal and UMCf. The columns were two inches in diameter and 50 inches long. Approximately three kilograms (kg) of dried Qal soil were packed in the two Qal columns and approximately 2.3 kg of dried UMCf soil were packed in the two UMCf columns. The approximate dry bulk densities of soil were 1,300 kilogram per cubic meter (kg/m³) for the Qal columns and 910 kg/m³ for the UMCf columns. Before biodegradation testing started, the dried soils were saturated with groundwater, free of any electron donor or nutrients. A detailed discussion of the experimental setup of the columns is provided in the final UNLV laboratory report.

The influent groundwater for the Qal columns was obtained from CTMW-03S, and the influent groundwater for the UMCf columns was obtained from CTMW-03D. The Qal columns were gravity fed with groundwater obtained from the treatability study area initially, but the Qal columns were operated under a pressure of 5 pounds per square inch (psi) from Day 28 until the end of the study due to decreases in the column flow rate, which were attributed to the transport of fine-grained material present in the Qal to the lower portion of the column, where they accumulated. The UMCf columns began under a pressure of 15 psi, but the pressure was reduced to 10 psi on the first day of the study and generally remained at this pressure throughout the study. Each column was saturated with groundwater in a down flow mode. The composition of the column influent varied over time, and column influent mixtures consisted of groundwater with EVO; a mixture of industrial sugar wastewater, groundwater, and EVO; and groundwater alone.

The solid media from the soil and plastic bioreactor were collected at the end of the column study and shipped to a commercial laboratory for bacterial community analysis. The laboratory extracted deoxyribonucleic acid (DNA) and used Illumina next-generation sequencing technology to identify the microorganisms. The primers selected for the study were previously used in a study (Coates, et al., 1999) to identify bacteria capable of reducing perchlorate but present in uncontaminated soil. The final results obtained from the laboratory included the percentages for each organism identified to species level.

3.3.2.2 Results

The main findings of the laboratory biological reduction column studies are as follows:

- Hexavalent chromium reduction was attainable under flow-through conditions using Site groundwater.
 The hexavalent chromium reduction rates were faster in the Qal columns, where hexavalent chromium
 concentrations reached non-detect levels in 45 days. In comparison, hexavalent chromium
 concentrations reached non-detect levels in 90 days in the UMCf columns. The results suggested that
 EVO and industrial sugar wastewater were effective at promoting reducing conditions and that hexavalent
 chromium-reducing microorganisms were present in native soil and groundwater.
- Denitrification and perchlorate reduction were attainable under flow-through conditions using Site
 groundwater. Denitrification and perchlorate reduction rates were faster in the Qal columns. The rate of
 denitrification, however, was affected by the concentration of hexavalent chromium. Decreasing
 concentrations of hexavalent chromium typically preceded higher rates of denitrification. Increasing rates
 of chlorate and perchlorate reduction were observed in response to decreasing concentrations of nitrate.
- Higher hydraulic residence time (contact time) significantly improves the rate of in-situ biological reduction of hexavalent chromium and nitrate.
- As discussed in Section 2.1.1, EVO behaves as a slow release electron donor. When groundwater flowed
 through soil columns to which EVO was added, the excess oil that did not adsorb to the soil was flushed
 out. Sorbed oil was slowly released, as measured by the COD in the effluent of the columns. In field
 application, the influence of EVO addition may be expected to be well beyond the vicinity of injection due
 to groundwater transport of a portion of the oil.
- No clogging was observed in the Qal or UMCf columns caused by the biological activity, but reduced flow
 rates in the Qal columns were observed due to displacement of the fine material contained in the Qal to
 the bottom of the Qal columns.

3.4 CHEMICAL REDUCTION STUDIES

The experimental methodology and results of chemical reduction batch microcosm and column studies performed by UNLV is described in this subsection.

3.4.1 Batch Microcosm Studies

The batch microcosm studies described herein were performed to assess the potential for CPS or ferrous sulfate to be used as reducing agents for in-situ hexavalent chromium reduction at the Site.

3.4.1.1 Microcosm Setup and Effectiveness Monitoring

For bench-scale study purposes, a low and a high hexavalent chromium concentration was established to evaluate the hexavalent chromium removal efficiency of CPS and ferrous sulfate under two different concentration ranges present at the Site. The low concentration of hexavalent chromium was 500 μ g/L, and the high concentration of hexavalent chromium was 10,000 μ g/L.

Batch chemical reduction studies were conducted in one liter glass beakers using a Phillip and Bird Batch Tester. A preliminary batch test was performed to select a range of reducing agent (i.e., CPS or ferrous sulfate) to chromium ratios. Hexavalent chromium concentrations in groundwater samples collected for the batch tests from UFIW-06S (Qal) and UFIW-06I (UMCf) were less than 500 μ g/L. In response, Qal and UMCf groundwater samples were spiked to achieve a concentration of approximately 10,000 μ g/L for a high concentration test, and the samples for use in a low concentration test were generally spiked to achieve a concentration of approximately 500 μ g/L. The final UNLV laboratory report in Appendix A describes the experimental methodology used to select

the quantity and type of reducing agent to hexavalent chromium concentration ratios and conduct the batch chemical reduction tests.

For the batch chemical reduction studies, 250 or 500 mL of Site groundwater, either a low concentration or high concentration replicate, was placed in a glass beaker. The reducing agent dose was added and the contents of each beaker (i.e., water, any suspended solids, and coagulant) were stirred rapidly at 100 rpm for a minute. After one minute, the mixer speed was decreased to 30 rpm to promote slow mixing for a period of 30 minutes. After 30 minutes, the contents of the beaker were transferred to a graduated cylinder to allow formed solids to settle for 10 minutes. The goal of the settling period was to evaluate the mass of precipitated solids generated by addition of ferrous sulfate and CPS.

Approximately 100 mL of supernatant from the graduated cylinder were subsequently transferred into vials to measure pH, total chromium, and turbidity. For hexavalent chromium analysis, about 25 mL of the decant solution was preserved with trace metal quality nitric acid for inductively coupled plasma analysis. The settled solids volume, after 10 minutes settling time, was recorded. The entire cylinder content was then transferred to a large bottle and centrifuged for 30 minutes at 3,000 rpm. The supernatant was carefully poured and filtered (0.45 µm membrane filter) to analyze for nitrate, perchlorate, and hexavalent chromium. The solids were transferred into pre-weighed aluminum dishes for suspended solids testing. The blades and the beaker walls were inspected for scale formation. The complete results of the batch studies are presented in the final UNLV laboratory report (Appendix A).

3.4.1.2 Results

The key results and findings from the batch chemical reduction microcosm studies include the following:

- A 99% reduction in hexavalent chromium concentrations in the Qal and UMCf microcosms was observed
 when CPS was used as a reducing agent. The optimal CPS dosage identified was twice the calculated
 stoichiometric ratio. Higher removals were not observed when CPS dosages above twice the calculated
 stoichiometric ratio were used.
- Similar to CPS, a 99% reduction in hexavalent chromium concentrations in the Qal and UMCf microcosms was observed when ferrous sulfate was used as a reducing agent. The optimal ferrous sulfate dosage was at least five times the stoichiometric ratio. The use of ferrous sulfate as a reducing agent generated a larger volume of precipitated solids than the use of CPS as a reducing agent.
- The use of CPS or ferrous sulfate did not affect nitrate or perchlorate concentrations.
- The final pH standards obtained after treatment using CPS or ferrous sulfate were within approximately 6 to 9 standard units.

3.4.2 Chemical Reduction Column Studies

The feasibility of using CPS as a reducing agent for in-situ hexavalent chromium reduction was evaluated as part of a two-stage study using laboratory-scale column reactors. CPS was selected as the reducing agent for the chemical reduction column studies as it was able to achieve 99% reduction in hexavalent chromium concentrations with a lower stoichiometric ratio than ferrous sulfate. During the preliminary stage, column studies were performed using two columns, one for the Qal and one for the UMCf, with a low concentration of hexavalent chromium in groundwater (1,000 μ g/L) for a period of 36 days. During the second stage, column studies were performed using three columns, one low-concentration replicate for the Qal (1,000 μ g/L), one low concentration replicate for the UMCf, and one high-concentration replicate for the UMCf (10,000 μ g/L). The column reactors were designed to evaluate treatment of hexavalent chromium-contaminated groundwater at the Site, such that the concentrations and flow rates were comparable to the concentrations and hydraulic conductivities present at the Site, in both the Qal and UMCf.

3.4.2.1 Column Setup and Effectiveness Monitoring

For the preliminary column studies, two columns, one for the Qal and one for the UMCf, were packed with layers of glass beads and gravel and packed soil produced during the drilling of UFIW-02S and CTMW-03D to simulate groundwater velocities within the Qal and UMCf. The preliminary column tests were performed using groundwater with a low concentration of hexavalent chromium $(1,000~\mu g/L)$. The Qal column was gravity fed, and the UMCf column was operated under a pressure of 30 psi. Based on the batch chemical reduction microcosm studies, the minimum dosage of CPS required was twice the stoichiometric ratio (34 mL CPS /1,000 L groundwater). However, due to concerns related to inadequate mixing in the columns, the effective dosage used during the preliminary column studies was 20 times the stoichiometric ratio based on previous experience and observed inadequate mixing in test columns. CPS was introduced into the Qal column using a drip delivery system that maintained a continuous CPS flow rate between 370 microliters per minute (μ L/min) and 400 μ L/min. CPS was introduced into the UMCf column using a syringe to inject the reducing agent through a port drilled approximately one inch above the contact soil (simulated aquifer zone being tested) in the column.

For the column studies during the second stage, three columns, one low-concentration replicate for the Qal (1,000 μ g/L), one low-concentration replicate for the UMCf, and one high-concentration replicate for the UMCf (10,000 μ g/L) were packed with layers of glass beads and gravel and packed soil as described in the final UNLV laboratory report (Appendix A). The Qal column was gravity fed, and the UMCf columns were operated under a pressure of 15 psi. The dosage of CPS for the low-concentration replicates was 20 times the stoichiometric ratio, and the dosage of CPS for the high-concentration replicate was 40 times the stoichiometric ratio. The increased dosages used a factor of 10 to account for inadequate mixing within the columns. For the Qal columns, half of the estimated dosage of CPS (2 mL) was injected twice everyday (i.e., 1 mL on each injection). For the UMCf columns, the CPS injection dosages of 0.3 and 1 mL for the low and high concentration columns respectively, were injected once a day. The operation of the columns included measurement of flow rate, throughput volume, pH, hexavalent chromium (as a 24-hour composite sample and a grab sample), and total chromium (in composite samples). Every two days, groundwater spiked with 1,000 μ g/L or 10,000 μ g/L of hexavalent chromium was prepared, and added to the feed tanks. The chromium concentration in the feed tank was measured every time new groundwater was added to the tank.

3.4.2.2 Results

The main findings of the laboratory chemical reduction column studies are as follows:

- Column studies indicated that reduction of hexavalent chromium is feasible using CPS in both the Qal and UMCf as studies achieved over 99% reduction in hexavalent chromium concentrations in groundwater for columns packed with soil from both the Qal and UMCf.
- The use of CPS as a reducing agent is more effective for higher concentrations of hexavalent chromium than for lower hexavalent chromium concentrations.
- Increasing the amount of CPS from 20 times to 40 times the stoichiometric ratio had no significant effect on the reduction of hexavalent chromium concentrations in groundwater for columns packed with soil from the UMCf.

4.0 FIELD TREATABILITY STUDY ACTIVITIES

As described in Sections 1 and 2, two comparison studies were implemented to evaluate the feasibility of, and the optimal approach for, achieving in-situ reduction of hexavalent chromium in groundwater at the Site. This section provides a summary of the field activities associated with each of the biological and chemical reduction studies.

4.1 BIOLOGICAL REDUCTION STUDY

The biological reduction study was located east of the previous Soil Flushing Treatability Study area in the Central Retention Basin and approximately 640 feet upgradient of the IWF (Figure 2). This area was selected for the following reasons:

- Sufficient distance from the IWF to minimize potential for unintended migration of the carbon;
- Not located within a reported paleochannel (Ramboll Environ, 2017);
- High hexavalent chromium concentrations expected to be present (Ramboll Environ, 2017);
- · No significant structures present in the Central Retention Basin; and
- Located within the area where in-situ reduction in hexavalent chromium would reduce the influent loading to the IWF.

The layout of the treatability study consisted of a transect injection design with injection wells configured in a single row and a network of generally downgradient monitoring wells used for performance monitoring to observe and evaluate potential influence from the injections (Figure 3a). The study area consisted of three paired injection well locations and six dual-nested monitoring well locations. Each of the three-paired injection well locations (CTIW-01S/D, CTIW-02S/D, and CTIW-03S/D) consisted of a shallow well (screened in the Qal, designated by "S") and a deep injection well (screened in the UMCf, designated by "D") that were installed in separate boreholes. Each dual-nested monitoring well location (two wells installed within the same borehole) consisted of one shallow well (CTMW-01S through CTMW-06S) that is screened in the Qal and one deep well (CTMW-01D through CTMW-06D) that is screened in the UMCf. Additional details regarding well construction and screen intervals are provided in Section 4.1.3.1 and a depiction of the layout is provided in Figure 3a.

4.1.1 Biological Study Area Geology

There are two reported paleochannels within the alluvial deposits that cross the IWF in a northerly direction (Figure 2). Similar to the other reported paleochannels throughout the region, these paleochannels are inferred to have eroded into the surface of the UMCf during infrequent flood runoff periods with stream-deposited sands and gravels. The sand and gravel deposits are narrow, vary in thickness, and exhibit higher permeability than the adjacent well-graded deposits. The two on-Site paleochannels are presumed to merge downgradient of the Site and continue through the area towards the Las Vegas Wash. The nearest reported paleochannels appear to be approximately 200 feet east and 400 feet west of the biological study area (Ramboll Environ, 2017).

The alluvial deposits generally extend to 20 to 30 feet bgs at the Site (Ramboll Environ, 2017). Depending on location, Qal soil types observed in the biological reduction study area generally consist of well-graded sands, fine- to medium-grained poorly-graded sands, and silty sand, all with varying amounts of gravel (Figures 3b and 3c; Appendix B). The contact between the base of the Qal and the top of the UMCf in the biological reduction study area is encountered at a depth of approximately 24 feet bgs (Figures 3b and 3c). The UMCf in the area consists of predominantly silt with thin interbedded sandy silt, and clayey silt to a depth up to 61.5 feet bgs (Appendix B). The UMCf is also characterized by cemented white nodules varying in size (from fine to coarse gravel) and percentages, ranging from <1% to 30%, throughout the sampled interval. The nodules were observed to be reactive to hydrochloric acid, indicating they may be comprised of calcium carbonate. The coarse-grained paleochannel deposits were not encountered in the boreholes advanced in the biological reduction study area.

4.1.2 Biological Study Area Hydrogeology

The depth to groundwater at the Site ranges from about 11 to 43 feet bgs and is generally deepest in the southern portion of the Site; the depth to groundwater becomes shallower to the north, toward the AWF (Ramboll Environ, 2017). The direction of groundwater flow on the Site is generally towards the north to north-northwest and then changes slightly to the northeast offsite. Groundwater flow may be altered in areas across the Site as a result of the paleochannels, the on-Site barrier wall, and the IWF.

Based on data collected from boreholes advanced in the Central Retention Basin for the biological reduction study, groundwater was encountered in the Qal at depths ranging from 22 feet to 23 feet bgs (Figures 3b and 3c; Appendix B). The groundwater potentiometric surface measured at these locations following the installation of the injection and monitoring wells was approximately 22.5 feet bgs, for both shallow and deep well locations. Groundwater in both shallow wells screened within the alluvium and deep wells screened within the UMCf flows generally northeast (Figures 5a and 5b). The average hydraulic gradient calculated in the study area for wells screened in the alluvium was calculated to be 0.019 feet per foot (ft/ft) in the area around the monitoring wells and 0.055 ft/ft, in the area between the injection and monitoring wells. The average hydraulic gradient calculated in the study area for wells screened in the UMCf was calculated to be 0.021 ft/ft.

Several hydrogeologic investigations have been performed at the Site since the early 1980s to obtain aquifer data (i.e., hydraulic conductivity [K], transmissivity [T], and storativity [S]) in support of groundwater remediation efforts. Aquifer tests performed include slug and baildown tests, constant rate pumping tests, step-drawdown tests, and recovery tests. Based on the results of these tests, the average hydraulic conductivity for the alluvium and UMCf was calculated to be 38.5 feet per day (ft/d) and 3.2 ft/d, respectively (Tronox, LLC, 2010).

Tetra Tech performed additional aquifer tests as part of the biological reduction study and results are discussed in Section 5.1.5. The groundwater flow velocity was estimated for the alluvium and UMCf in order to evaluate how quickly the proposed carbon substrate may pass through the study area. Based on the estimated K values for shallow and deep wells (see Section 5.1.5; Appendix C), hydraulic gradient values of 0.011 to 0.055 feet per foot (ft/ft; shallow wells) and 0.014 ft/ft to 0.021 (deep wells), average porosity values of 47.5% (shallow wells) and 61.2% (deep wells) as determined from site-specific sampling (See Section 5.1.1), and an estimated effective porosity of 15%, the estimated groundwater velocity for the shallow and deep intervals of the biological reduction study area ranges from 0.003 ft/d to 47 ft/d and 0.00004 ft/d to 0.42 ft/d, respectively.

4.1.3 Drilling and Well Installation

This section describes the activities associated with drilling and installation of wells located in the Central Retention Basin that were used for the biological reduction study.

4.1.3.1 Installation

Prior to advancing the borings, Tetra Tech reviewed available utility maps and retained the services of a geophysical locator to check for underground utility lines. Each borehole was cleared for utilities to at least 5 feet bgs using a Hydrovac unit that injected pressurized water through a handheld wand and extracted the resulting slurry by a powerful vacuum.

As previously explained, a total of three paired injection well clusters were installed. Each cluster consisted of one injection well screened in the Qal, designated CTIW-01S through CTIW-03S and one injection well screened in the UMCf, designated CTIW-01D through CTIW-03D. The injection wells were installed in separate boreholes to avoid potential short circuiting between the shallow and deep wells during injection activities. Additionally, six dual-nested monitoring wells (two wells installed within the same borehole) screened separately in each the Qal and the UMCf, designated CTMW-01S/D through CTMW-06S/D, were installed as part of the biological reduction study to monitor remedial effectiveness (Figure 3a).

20

The borehole drilling and well installation activities were conducted during three mobilizations. This phased approach was used to collect area-specific data, including groundwater levels, physical soil properties, and estimated groundwater gradient, in order to adjust the overall injection and monitoring network. The first phase occurred from November 28 through December 1, 2016, and consisted of the drilling and installation of two injection wells (CTIW-01S and CTIW-01D), and one dual-nested monitoring well (CTMW-03S/D). The well IDs were based on the preliminary well layout and not based on the order of installation. Based on the data obtained from this mobilization, the layout was adjusted for the next phase of wells to include the addition of one more clustered injection well based on the results of the slug tests and geological characteristics in the area. The second phase occurred from March 20 through March 27, 2017, and consisted of the drilling and installation of the remaining two paired injection well locations (CTIW-02S/D and CTIW-03S/D) and three additional dual-nested monitoring wells (CTMW-01S/D, CTMW-02S/D, and CTMW-04S/D). The results and observations obtained from the baseline groundwater monitoring, first carbon substrate injection event, and first three performance monitoring events were used to guide the final phase of drilling and well installation. The third and final phase occurred from June 5 through June 6, 2017, and consisted of the drilling and installation of two dual-nested monitoring wells (CTMW-05S/D and CTMW-06S/D).

All drilling and well installation activities were conducted by National Exploration, Wells and Pumps (National, later acquired by Cascade Drilling, LP) using the hollow-stem auger method. Soil for lithological logging purposes was collected using a CME Continuous Sample Tube System consisting of a 3-inch by 5-foot sample tube with a cutting shoe that extends below the auger cutter head. Soil for analytical purposes (chemical testing and physical parameter analysis) was collected using the California-modified split-spoon sampler lined with stainless steel sleeves. Upon retrieval from the borehole, the lowermost sleeve was removed from the sampler and the ends of the sleeve were covered with Teflon sheets and tight-fitting plastic caps. The soil samples were then labeled, placed in resealable plastic bags, and stored in an ice chest cooled with ice pending delivery to the laboratory under chain-of-custody protocols. The soil borings were logged by a trained geologist or engineer in general accordance with the American Society for Testing and Materials (ASTM) Standard D-2488-09 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM International, 2009). Copies of the soil boring logs are provided in Appendix B.

Depth discrete groundwater samples were collected while performing drilling during the first mobilization. A SimulProbe sampler was utilized to target specific saturated intervals corresponding to the shallow and deep well screens. Grab groundwater samples were successfully collected at a depth of 36 ft bgs from CTIW-01D and CTMW-03D. Insufficient water was present at 23 ft bgs to collect the grab groundwater samples from the saturated alluvium. The SimulProbe sampler is used to collect both soil and groundwater samples concurrently. The probe is driven into the ground at the selected interval by a hammer. The core is collected in the core-barrel at the bottom of the probe. The probe is then lifted up a few inches, opening up a hidden compartment that provides a pathway for water to channel into the canister. The water canister is closed by back pressurization and utilizes compressed gas to lift the water sample to the surface through a network of tubing and check valves.

A summary table of the well construction details is provided along with the boring logs that contain well construction diagrams in Appendix B. All of the wells installed consisted of 2-inch inner diameter Schedule 40 PVC casing and slotted Schedule 40 PVC screen. The shallow wells (designated "S") were screened in the Qal, just above the Qal/UMCf contact, with 5-foot screens from approximately 19 to 24 ft bgs. The deep wells (designated "D") were screened in the UMCf at 10 feet below the Qal/UMCf contact with varied screen lengths. During the first phase, the deep injection well CTIW-01D was installed with a 5-foot screen from approximately 33 to 38 feet bgs and the deep monitoring well was installed with a 15-foot screen from approximately 34 to 49 feet bgs. All of the deep injection and monitoring wells installed in the second phase were screened with 15-foot screens from approximately 34 to 49 feet bgs. The two deep monitoring wells installed in the third phase were screened with 20-foot screens from approximately 34 to 54 feet bgs. The screen intervals were increased for the deep wells installed during the second and third phases based on the hydrogeology observed during the first phase.

Following the completion of well construction, but no sooner than 24 hours after well construction was complete, the newly installed wells were developed using a surge block and bailer to swab and surge the filter pack and remove sediment from the wells. This process was followed by pumping with a submersible pump to purge the well of fine-grained sediment. Well development was considered complete when three to ten casing volumes of water had been removed from the well, and index parameters consisting of pH, specific conductivity, turbidity, and temperature were stable (pH within 0.1 and other parameters within 10 percent) over three consecutive measurements.

Once all injection and monitoring well installation activities were complete, a land surveyor surveyed the horizontal coordinates of each well relative to North American Datum 83 with an accuracy of 0.1 foot. The elevation of the ground surface and top of well casing measuring point relative to North American Vertical Datum 88 were surveyed with accuracies of 0.1 foot and 0.01 foot, respectively.

4.1.3.2 Laboratory Analysis

Selected soil and depth-discrete groundwater samples collected during drilling were submitted to TestAmerica Laboratories, Inc., for environmental analyses and/or PTS Laboratories, Inc., for physical parameter analyses, which are presented in *Table 1*. The depth-discrete groundwater samples were used for initial screening of the groundwater concentrations within the biological reduction study area. Depth-discrete groundwater samples were obtained at one depth from each of the borings CTIW-01S, CTIW-01D, CTMW-03S, and CTMW-03D. The collection of additional depth-discrete groundwater samples was attempted, but were unsuccessful due to poor groundwater recovery at these locations. However, the vertical extent of hexavalent chromium, chromium, perchlorate, and chlorate in groundwater were assessed later through depth-discrete groundwater sampling performed at boring location CTMW-07D as part of the Remedial Investigation Phase 2 Modification No. 7 (Tetra Tech, Inc., 2017). More representative groundwater samples were collected after well installation as part of the baseline groundwater monitoring event as part of the effective monitoring program (Section 4.1.6).

Table 1 Baseline Soil and Depth-Discrete Groundwater Sampling Protocol

Parameter(s)	Method	Purpose
Soil Analyses		
Hexavalent Chromium	SW7199	Estimate mass of chromium in saturated soil
Total Chromium	SW-6010B	Estimate mass of chromium in saturated soil
Perchlorate and Chlorate	E314 and E300.1B	Assess treatment of other site COPCs
Total Organic Carbon	E415	Estimate available natural organic carbon
Soil pH	SW9045	Assess geochemical conditions
Soluble Cations and Anions	See Notes 1 and 2	Assess salt loading
Total Dissolved Solids ²	E160.1	Assess salt loading
Metals ³	SW6020	Assess potential secondary impacts of treatment
Physical Parameters ⁴	API RP40 ASTM D2216 EPA 9100	Assess geophysical properties, porosity and hydraulic conductivity of soil

Parameter(s)	Method	Purpose
Depth-Discrete Groundwater Analyses		
Hexavalent Chromium	SW7199	Assess vertical extent of chromium impacts
Total Chromium	SW-6010 or 6020	Assess vertical extent of chromium impacts
Perchlorate and Chlorate	E314	Assess vertical extent of perchlorate impacts
Chloroform	8260B	Assess potential chloroform impacts

Notes:

- 1 Cations include sodium, potassium, calcium, and magnesium (Method SW6020). Anions include chloride, sulfate, nitrate (Method E300/SW9056), carbonate, and bicarbonate (Method E2320B).
- 2 Analysis performed on water extract prepared per method SW9056.
- 3 Metals include arsenic, iron, and manganese.
- 4 Physical parameters include native-state permeability to water (hydraulic conductivity), grain density, dry bulk density, total porosity, air-filled porosity, moisture content and total pore fluid saturation (reported as water only).

4.1.3.3 Management of Investigation-Derived Wastes

Investigation-derived waste (IDW) generated during the field testing program was managed according to applicable state, federal, and local regulations and as described in *Field Guidance Document No. 001, Managing Investigation-Derived Waste* in the Field Sampling Plan, Revision 1 (ENVIRON, 2014b). IDW that was generated during the field testing program included soil cuttings, personal protective equipment, equipment decontamination water, and groundwater generated during depth-discrete groundwater sampling and well development. IDW was stored in plastic-lined roll-off bins. Solids were characterized by collecting representative samples, as necessary, to determine disposal options. Soil bins were labeled with "pending analysis" labels, the date accumulation began, contents, source, and contact information, and stored in a designated area. Waste water generated during purging or decontamination activities was temporarily stored in 500-gallon totes and transferred to the GW-11 Pond.

4.1.4 Aquifer Testing

Due to variable hydraulic conductivities reported in the vicinity of the biological reduction study area and relatively limited information available, aquifer tests (specific capacity and slug testing) were performed in the newly installed shallow and deep wells screened in the Qal and UMCf to obtain location-specific hydraulic conductivity. Although shallow wells were installed and screened within the alluvium, insufficient water was present in the shallow wells to permit slug testing. However, specific capacity tests were conducted in the shallow wells, along with the deep wells, in order to provide supplemental estimates of aquifer parameters, including hydraulic conductivity, prior to injection testing. Slug tests were also performed in the deep wells screened in the UMCf. Select wells were also tested after the completion of the biological reduction study, approximately 2 months following the last carbon substrate injection event, to assess whether the injections affected hydraulic conductivity. Results obtained from the slug and specific capacity testing are summarized in Section 5.1.5 and are provided in Appendix C, which includes software analysis reports.

The slug tests were performed in general accordance with American Society for Testing and Materials (ASTM) Standard D4044-96 (ASTM International, 2008). Prior to conducting each slug test, the water level in the well was measured manually with an electronic water level probe (Solinst Model 101 water level meter or Solinst Model 122 interface probe) to determine the static groundwater level. An electronic pressure transducer/data logger (Solinst Levelogger Gold M5 pressure transducer) was then suspended in the well, and water levels were monitored manually until static conditions were reestablished. A falling-head test was then conducted by smoothly

lowering a length of weighted and sealed PVC pipe (slug) into the well, securing it in place above the transducer, and recording the rate of water level decline. Once static conditions were reestablished, a rising-head test was conducted by removing the slug and allowing the water level to again recover to static conditions while recording the rate of recovery. At the end of each test, the pressure transducer was removed from the well, and the water level displacement data was downloaded to a laptop computer. The data was interpreted using AQTESOLV (Duffield, 2014) analysis software.

Specific capacity tests were conducted on the newly installed wells by utilizing a MegaMonsoon® electronic pump set at a constant flow rate. Prior to conducting each specific capacity test, the water level in the well was measured manually with an electronic water level probe (Solinst Model 101 water level meter or Solinst Model 122 interface probe) to determine the static groundwater level. The pump was then started and water levels were monitored manually to record the rate of water level decline. The pump was then stopped and water levels were again monitored manually to record the rate of water level recovery until static conditions were reestablished. The recorded specific capacity test data was interpreted using AQTESOLV (Duffield, 2014) analysis software.

4.1.5 Injections

This section describes the three carbon substrate injection events that were conducted to promote in-situ biological reduction of hexavalent chromium. The amount of carbon substrate injected during each event was determined by taking into consideration the size and depth of the treatment area, concentrations and mass flux of hexavalent chromium and other COPCs in the treatment zone, stoichiometric demand (based on the chemical equation provided in Section 2.1), and an appropriate safety factor using the bench-scale results. For the slow-release substrate, EOS, the manufacturer suggested injecting approximately three percent of the pore volume, as indicated by the following equation:

Injection Volume of EOS = Treatment Area x Treatment Depth x Porosity x 3% x Safety Factor

Subsequent injection events were conducted based on the results of the performance monitoring results, using both contaminant and TOC concentrations as indicators of quantities and timing.

4.1.5.1 Carbon Substrate Injection Event 1

The first carbon substrate injection event was conducted between April 17 and April 21, 2017 using a custom-built injection platform mobilized to the Site. Based on the laboratory bench-scale study results and other industrial applications, the carbon substrates selected for this event included a slow-release substrate, EOS_{PRO}®, as well as soluble substrates, industrial sugar wastewater and granular sugar. Sodium sulfite was used as an oxygen scavenger to promote anaerobic conditions and Aquapure 3601® was used as an additional phosphate source.

A total of 8,459 gallons (2,849 gallons across the shallow wells and 5,610 gallons across the deep wells) of solution containing the carbon substrates and injection amendments was injected. Additionally, a total of 5,358 gallons (2,524 gallons across the shallow wells and 2,834 gallons across the deep wells) of Stabilized Lake Mead Water (SLMW), used as chase/flush water, was injected to enhance carbon substrate distribution across the injection well network. The amount of chase/flush water was estimated based on transport of the carbon substrate solution within the desired 15-foot radius of influence of the injection well network. In general, the substrate and SLMW were evenly distributed among all of the shallow and deep injection wells. For the shallow wells, sustained injection pressures generally ranged from 0 to 12 pounds per square inch gauge (psig) and average flow rates ranged from 1.2 to 3.6 gpm. For the deep wells, sustained injection pressures generally ranged from 0 to 10 psig and average flow rates ranged from 1.3 to 4.2 gpm. Injection logs for the first carbon substrate injection event are provided in Appendix D.

4.1.5.2 Carbon Substrate Injection Event 2

The second carbon substrate injection event was conducted from June 6 to June 9, 2017, using the same injection rig setup as the previous injections. The carbon substrates selected for this event were similar to the first event and included EOS PRO®, industrial sugar wastewater, granular sugar, and Aquapure 3601®. Changes to the injectate solution included the addition of ascorbic acid, urea, and sodium bicarbonate. To evaluate an alternative oxygen scavenger, ascorbic acid was used in the second injection event. Additionally, a 39% solution urea/diammonium phosphate (urea/DAP) blend was used as an alternate phosphate source and a way to introduce nitrogen. Finally, sodium bicarbonate was added as needed to the injection solution to mitigate the low pH of the industrial sugar wastewater by increasing the pH of the injection solution and minimizing the potential pH shock to the microbial populations.

A total of 8,811 gallons (2,211 gallons across the shallow wells and 6,600 gallons across the deep wells) of solution containing the carbon substrates and injection amendments was injected. Additionally, a total of 9,639 gallons (4,239 gallons across the shallow wells and 5,400 gallons across the deep wells) of SLMW used as chase/flush water was injected to enhance carbon substrate distribution across the injection well network. The amount of chase/flush water was estimated based on transport of the carbon substrate solution within the desired 15-foot radius of influence of the injection well network. In general, the substrate and SLMW were evenly distributed among all of the shallow and deep injection wells. For the shallow wells, sustained injection pressures generally ranged from 2 to 15 psig and average flow rates ranged from 2.3 to 4.7 gpm. For the deep wells, sustained injection pressures generally ranged from 3 to 6 psig and average flow rates ranged from 2.4 to 8.6 gpm. Injection logs for the second carbon substrate injection event are provided in Appendix D.

4.1.5.3 Carbon Substrate Injection Event 3

The third carbon substrate injection event was conducted from August 9 to August 11, 2017, using the same injection rig setup as the previous injections. The carbon substrates selected for this event were EOS_{PRO}® and molasses, to evaluate the potential use of molasses as an alternative to industrial sugar wastewater or granular sugar. Ascorbic acid was also included in the injectate solution as an oxygen scavenger to promote anaerobic conditions. A 39% solution urea/DAP blend was used as a phosphate and nitrogen source. Additionally, sodium bicarbonate was added to the injection solution to assist in buffering potential pH changes.

Based on the performance monitoring results following injection events 2 and 3, the third carbon substrate injection event primarily focused on providing carbon substrate to the deep wells with the goal of maintaining existing TOC concentrations in the shallow wells. A total of 6,450 gallons (450 gallons across the shallow wells and 6,000 gallons across the deep wells) of solution containing the carbon substrates and injection amendments was injected. Additionally, a total of 9,975 gallons (2,250 gallons across the shallow wells and 7,725 gallons across the deep wells) of SLMW used as chase/flush water was injected to enhance carbon substrate distribution across the injection well network. The amount of chase/flush water was estimated based on transport of the carbon substrate solution within the desired 15-foot radius of influence of the injection well network. In general, the substrate and SLMW were evenly distributed among all of the shallow and deep injection wells. For the shallow wells, sustained injection pressures generally ranged from 5 to 7 psig and average flow rates ranged from 2.9 to 3.6 gpm. For the deep wells, sustained injection pressures generally ranged from 7 to 16 psig and average flow rates ranged from 2.5 to 4.4 gpm. Injection logs for the third carbon substrate injection event are provided in Appendix D.

4.1.5.4 Chase/Flush Water

The quantity of SLMW water (a total of approximately 24,000 gallons) that was injected for chase/flush water over the three injection events is estimated to be less than five percent of the groundwater that flowed through the biological reduction treatment area during the 24-week monitoring period following the first injection event. Therefore, the injected chase/flush water is unlikely to have a significant impact on concentrations observed

within the biological reduction treatment area. This is further supported by the fact that groundwater concentration reductions were not observed consistently across every constituent analyzed as would be expected if chase/flush water dilution was a significant factor.

4.1.6 Effectiveness Monitoring Program

After development of the wells, groundwater samples were collected from both injection and monitoring wells in the study area to establish baseline conditions prior to the injections. After injections had occurred, groundwater samples were periodically collected from downgradient monitoring wells using low-flow purging and sampling techniques. Groundwater sampling activities followed the guidance of the Field Sampling Plan, Revision 1 (Environ, 2014b). A low-flow pump was used to purge the monitoring well at a rate between approximately 400 to 500 mL per minute to minimize drawdown and induce inflow of fresh groundwater. The pump discharge water was passed through a flow-through cell field water analyzer for continuous monitoring of field parameters (temperature, pH, turbidity, electrical conductivity [EC], dissolved oxygen [DO], and oxidation reduction potential [ORP]). Field parameters were monitored and recorded on field sampling forms during purging. Purging was considered complete and the wells were sampled when the field parameter readings and water levels stabilized, or after a maximum of one hour of purging. Groundwater samples were analyzed as outlined in *Table 2*. VOCs were added to the effectiveness monitoring program primarily to evaluate the potential effect of biological reduction on chloroform, a COPC at the Site. Field sampling logs are provided in Appendix E.

Table 2 Biological Reduction Study Effectiveness Monitoring Sampling Protocol

Analytical Re	equirements		F	Perfor	mance	e Mon	itoring	j Ever	nt	
		BL	1	2	3	4	5	6	7	8
Parameter	Analytical Method	Weeks Following Initial Injection Event								
		BL	2	4	6	9	13	18	22	24
Field Parameters										
EC	Field Meter	X	Х	Х	Х	Х	Х	Χ	Χ	Х
рН	Field Meter	X	Х	Х	Х	Х	X	Χ	Χ	Х
DO	Field Meter	X	Х	X	Х	Х	Х	Χ	Χ	X
ORP	Field Meter	X	Х	Х	Х	Х	X	Χ	Χ	Χ
Temperature	Field Meter	X	Х	Х	Х	Х	Х	Χ	Χ	Χ
Turbidity	Field Meter	X	Х	X	Х	Х	X	Χ	Χ	Х
Laboratory Analyses										
Hexavalent Chromium	SW7199	Х	Х	Х	Х	Х	Х	Х	Χ	Χ
Total Chromium	SW6010B	X	Х	Х	Х	Х	Х	Χ	Χ	Х
Alkalinity	SM2320B	X	Х	Х	Х	Х	Х	Χ	Χ	Х
TOC	SM5310B	X	Х	X	Х	Х	X	Χ	Χ	Х
Nitrate	E300.0	X	Х	Х	Х	Х	X	Χ	Χ	X
Sulfate	E300.0	X	Х	Х	Х	Х	X	Χ	Χ	Χ
Sulfide	EPA Method 9034	X	Х	X	Х	Х	Х	Χ	Χ	X
Total Nitrogen	E351.2	X	Х	Х	Х	Х	Х	Χ	Χ	Χ
Total Phosphorus	E365.3	X	Х	X	Х	Х	X	Χ	Χ	Χ
TDS	SM2540C	X	Х	Х	Х	X	X	Х	Х	X

Analytical Re	equirements		F	Perfor	mance	e Mon	itoring	g Ever	nt	
		BL	1	2	3	4	5	6	7	8
Parameter	Analytical Method	Weeks Following Initial Injection Event								
		BL	2	4	6	9	13	18	22	24
Field Parameters										
Ferrous Iron	HACH Method 8146	Х	Х	Х	Х	Х	Х	Х	*	Χ
Hardness	SM2340C	X	Х	Х	Х	X	Х	Χ	Х	Х
Manganese	SW6010B	Х	Х	Х	Х	X	Х	Χ	Х	Χ
Dissolved Methane	EPA Method RSK-175	Х	Х	Х	Х	Х	Х	Х	Х	Χ
Dissolved Metals ¹	SW6020	Х	Х	Х	Х	Х	Х	Χ	Х	Χ
Volatile Fatty Acids	SW8015-Modified	X	Х	Х	Х	Х	Х	Χ	Х	Х
Volatile Organic Compounds	EPA Method 8260B	Х	Х	Х	Х	Х	Х	Х	Х	Χ
Perchlorate	E314.0	X	Х	Х	Х	Х	Х	Χ	Х	Х
Chlorate/Chlorite	E300.1B	Х	Х	Х	Х	Х	Х	Х	Х	Χ
Chloride	E300.0	X	Х	Х	Х	Х	Х	Χ	Х	Х
PLFA	Microbial Insights Bio- Trap®	X					Х			
Microbial Census	Microbial Insights Bio- Trap [®]	X					Х			

BL - Baseline

PME - Performance Monitoring Event

EC - Electrical conductivity

DO - Dissolved Oxygen

ORP - Oxidation-reduction potential

TOC - Total organic carbon

TDS - Total dissolved solids

PLFA - Phospholipid fatty acids

4.2 CHEMICAL REDUCTION STUDY

The chemical reduction study area was located west of the AP-5 Pond and approximately 175 feet upgradient of the IWF (Figure 2). This area was selected for the chemical reduction study due to the distance from the biological reduction study area and the ability to take advantage of the existing AP Area Up and Down Flushing Treatability Study infrastructure. This included a row of four triple clusters of single-completion injection wells and a row of three downgradient triple-nested monitoring wells, which are part of the northern test plot, designated "Plot 1," of the AP Area Up and Down Flushing Treatability Study. It also used a near identical configuration located in the southern test plot, designated "Plot 2" (Figure 4a).

4.2.1 Chemical Study Area Geology

As described in Section 4.1.1, there are two reported paleochannels within the alluvial deposits that cross the IWF in a northerly direction (Figure 2). The nearest reported paleochannels appear to be approximately 160 feet to the east and 600 feet to the east of the chemical study area, respectively (Ramboll Environ, 2017). Qal soil types observed in the boreholes advanced in the AP Area consist mostly of silty sand with interbeds of well sorted sand,

^{*}Ferrous iron was not analyzed during this event.

¹ Dissolved metals include the following: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.

poorly sorted gravel, silty gravel, and poorly sorted sand (Figures 4b, 4c, and 4d; Appendix B). The contact between the base of the Qal and the top of the UMCf in the AP Area is encountered at depth ranging from approximately 27 feet to 34 feet bgs (Figures 4b, 4c, and 4d). The UMCf in the area consists of silt, silt with sand, and sandy silt to a depth up to 61.5 feet bgs (Appendix B), the maximum depth explored. The UMCf is also characterized by cemented white nodules that vary in size and percentages throughout the sampled interval, similar to lithologies in the Central Retention Basin. The coarse-grained paleochannel deposits were not encountered in the boreholes advanced in the AP Area; however, apparent depressions were observed in the vicinity of injection well clusters UFIW-03 and UFIW-06 where the Qal/UMCf contact was encountered at a depth up to approximately 2 feet lower than the depth observed in the adjacent wells (Figures 4c and 4d).

4.2.2 Chemical Study Area Hydrogeology

Based on data collected from boreholes advanced in the AP Area, groundwater was encountered in the Qal at depths ranging from approximately 28 feet to 34 feet bgs (Figures 4b, 4c, and 4d; Appendix B). The groundwater potentiometric surface measured at these locations following the installation of the injection, monitoring, and extraction wells ranges from approximately 26.9 feet to 28.4 feet bgs, for the shallow, intermediate and deep well screened intervals. Groundwater in shallow wells screened within the alluvium and deep wells screened within the UMCf flows generally north (Figures 6a, 6b, and 6c). The average hydraulic gradients calculated in the field study area for wells screened in the alluvium (shallow wells) and UMCf (intermediate and deep wells) were calculated to be 0.024 ft/ft, 0.033 ft/ft, and 0.023 ft/ft, respectively.

Several hydrogeologic investigations have been performed at the Site since the early 1980s to obtain aquifer data (i.e., K, T, and S) in support of groundwater remediation efforts. Aquifer tests performed include slug and baildown tests, constant rate pumping tests, step-drawdown tests, and recovery tests. Based on the results of these tests, the average hydraulic conductivity for the alluvium and UMCf was calculated to be 38.5 feet per day (ft/d) and 3.2 ft/d, respectively (Tronox, LLC, 2010).

Tetra Tech performed additional aquifer tests as part of the chemical reduction study. The groundwater flow velocity was estimated for the alluvium and UMCf in order to evaluate how quickly the proposed chemical injectate may pass through each area. Based on the estimated K values (see Section 5.2.2), hydraulic gradient values (0.0217 to 0.0236 ft/ft [shallow]; 0.0156 to 0.0192 ft/ft [intermediate]; 0.0179 to 0.0357 ft/ft [deep]), and porosity values for the shallow (40.7 to 66.4%), intermediate (42.3 to 69.2%), and deep wells (60.7 to 73.8%), the estimated groundwater velocity for the shallow, intermediate, and deep intervals of the study area ranges from 0.003 ft/d to 2.6 ft/d, 0.00027 ft/d to 0.44 ft/d, and 0.00004 ft/d to 0.40 ft/d, respectively.

4.2.3 Drilling and Well Installation

The ongoing AP Area Up and Down Flushing Treatability Study is primarily focused on the implementation of technologies relevant to the removal of perchlorate from the subsurface. However, some of the data and well infrastructure associated with the AP Area Up and Down Flushing Treatability Study was also pertinent to the evaluation of in-situ chemical reduction of hexavalent chromium. Therefore, data obtained from the drilling and well installation activities associated with the AP Area Up and Down Flushing Treatability Study were used to evaluate the potential implementation of chemical reduction processes for hexavalent chromium. Furthermore, injection wells installed as part of the AP Area Up and Down Flushing Treatability Study were available to be used for chemical injections and downgradient monitoring wells were available to be used to evaluate potential influence (Figure 4a). The following sections provide a summary of the drilling and well installation program portions of the AP Area Up and Down Flushing Treatability Study also relevant to the chemical reduction study.

4.2.3.1 Installation

Wells were installed and sampled as part of the AP Area Up and Down Flushing Treatability Study following the same procedures as previously discussed in Section 4.1.3.1. Four triple-cluster completion injection wells,

designated UFIW-01S/I/D through UFIW-04S/I/D, and three triple-nested groundwater monitoring wells, designated UFMW-01S/I/D through UFMW-03S/I/D, were installed for Plot 1 (Figure 4a). Four triple-cluster completion injection wells, designated UFIW-05S/I/D through UFIW-08S/I/D, and three triple-completion groundwater monitoring wells, designated UFMW-04S/I/D through UFMW-06S/I/D, were installed for Plot 2 (Figure 4a). Drilling and well installation were conducted by National Exploration, Wells and Pumps (later acquired by Cascade Drilling, LP) from July 12 to August 26, 2016, using the hollow-stem auger method. Selected soil samples were collected during drilling activities and the results will be presented as part of the ongoing AP Area Up and Down Flushing Treatability Study once complete. Soil for lithological logging purposes was collected using a CME Continuous Sample Tube System consisting of a 3-inch by 5-foot sample tube with a cutting shoe that extends below the auger cutter head. The soil borings were logged by a trained geologist or engineer in general accordance with ASTM Standard D-2488-09 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM International, 2009). Copies of the soil boring logs are provided in Appendix B.

All the injection and monitoring wells consisted of 2-inch inner diameter Schedule 40 PVC blank casing and 0.020-inch slotted PVC screen. The shallow wells (designated "S") were screened in the Qal 5 foot screens ending just above the Qal/UMCf contact from approximately 25 to 30 feet bgs. The intermediate wells (designated "I") were screened near the top of the UMCf beginning 5 feet or less below the Qal/UMCf contact from approximately 35 to 40 feet bgs. The deep wells (designated "D") were screened in the UMCf around 15 feet below the Qal/UMCf contact from approximately 45 to 50 feet bgs. UFIW-02I and UFIW-06I were installed with 10 feet screen intervals in the UMCf to evaluate the effect a larger screen interval has on injecting into the UMCf. Injection wells were installed in single completions to avoid potential short circuiting during injection activities. Well construction information is depicted on the soil boring logs provided in Appendix B. Following completion of installation activities, all wells were developed and then surveyed as previously discussed in Section 4.1.3.1.

4.2.3.2 Management of Investigation-Derived Wastes

Investigation-derived waste (IDW) generated during the field testing program was managed according to applicable state, federal, and local regulations and as described in *Field Guidance Document No. 001, Managing Investigation-Derived Waste* in the Field Sampling Plan, Revision 1 (ENVIRON, 2014b). The same procedures were followed as previously discussed in Section 4.1.3.3.

4.2.4 Aquifer Testing

Aquifer tests, including both slug and specific capacity tests, were performed in the installed wells to obtain location-specific hydraulic conductivity as described in Section 4.1.4. Slug tests were conducted in the intermediate and deep wells screened in the UMCf; however, there was insufficient water in the shallow wells screened in the alluvium to permit slug testing. Specific capacity tests were conducted in the shallow wells, along with one intermediate well, to provide supplemental estimates of aquifer parameters, including hydraulic conductivity prior to injection testing. Select wells were also tested after the injection was completed to assess whether the injections affected hydraulic conductivity. Details and results obtained from the aquifer testing are provided in Appendix C, which includes software analysis reports. The same procedures for aquifer testing described in Section 4.1.4 were followed for this testing.

4.2.5 Injections

The chemical injections completed as part of the chemical reduction study were conducted between August 7 and August 8, 2017. As with the biological reduction study, injections were performed using a custom-built injection platform. Based on the results of the laboratory bench-scale study, CPS was selected over ferrous sulfate for use in the field study. The amount of CPS injected during each event was determined by taking into consideration the size and depth of the treatment area, hexavalent chromium concentrations, stoichiometric demand (based on the chemical equation provided in Section 2.2), an appropriate safety factor based on bench-scale testing. The safety factor was used to account for calcium polysulfide reactions with other non-target compounds in the subsurface

and other considerations typically associated with in-situ injections. The equations used to determine the mass of hexavalent chromium present and planned injection volume were as follows:

Mass of $CrO_4^{2-} = [CrO_4] \times Treatment$ Area x Treatment Depth x Porosity

Injection Volume of CPS = Mass of CrO_4^{2-} x Stoichiometric Demand x Safety Factor

A total of 600 gallons of a CPS solution, comprised of 60 gallons of CPS and 540 gallons of SLMW, was generally injected evenly across the eight shallow and eight intermediate injection wells associated with Plot 1 and Plot 2 associated with the AP Area Up and Down Flushing Treatability Study (Figure 4a). Additionally, a total of 3,910 gallons of SLMW used as chase/flush water was injected to enhance subsurface distribution. For the shallow injection wells, sustained injection pressures were below 21 psig and average flow rates ranged from 4.5 to 4.6 gpm. For the intermediate injection wells, sustained injection pressures were below 15 psig and average flow rates ranged from 4.1 to 5.6 gpm. No injections were performed in the deep injection wells so they could be used to monitor the potential vertical migration of contaminants from injections into the intermediate injection wells. Injection logs for the chemical injection event are provided in Appendix D.

4.2.6 Effectiveness Monitoring Program

After development of the wells, groundwater samples were collected from both the injection and monitoring wells in the study area to establish baseline conditions prior to the injections. After injections had occurred, groundwater samples were periodically collected from downgradient monitoring wells using low-flow purging and sampling techniques. Groundwater sampling activities followed the guidance of the Field Sampling Plan, Revision 1 (Environ, 2014b). During low-flow purging of the wells, a pump was used to purge at a rate between approximately 0.1 to 0.13 gpm to minimize drawdown and induce inflow of ambient groundwater. The pump discharge water was passed through a flow-through cell field water analyzer for continuous monitoring of field parameters (temperature, pH, turbidity, EC, DO, and ORP). Field parameters were monitored and recorded on field sampling forms during purging. Purging was considered complete and the wells were sampled when the field parameter readings and water levels stabilized, or after a maximum of one hour of purging. Groundwater samples were analyzed as outlined in *Table 3*.

Table 3 Chemical Reduction Study Performance Monitoring Sampling Protocol

Analytical Rec	_l uirements	Weeks Following Injection Event			
Parameter	Analytical Method	BL	1	9	
Field Parameters					
EC	Field Meter	Χ	Χ	Χ	
рН	Field Meter	Χ	Χ	Χ	
DO	Field Meter	Χ	Χ	Χ	
ORP	Field Meter	Χ	Χ	Χ	
Temperature	Field Meter	Χ	Χ	Χ	
Turbidity	Field Meter	Χ	Χ	Χ	
Laboratory Analyses					
Hexavalent Chromium	SW7199	Х	Χ	Х	
Total Chromium	SW6010B	Х	Х	Х	
Nitrate	E300.0		X	Χ	
Sulfide	SM2540C		Х	Х	

Analytical Rec	Weeks Following Injection Event			
Parameter	Analytical Method	BL	1	9
TDS	SM2540C		Х	Х
Manganese	SW6010B			Х
Dissolved Metals ¹	SW6020			Х
Perchlorate	E314.0	Χ	Χ	Х
Chlorate/Chlorite	E300.1B		Х	Х

BL - Baseline

EC - Electrical conductivity

DO - Dissolved Oxygen

ORP - Oxidation-reduction potential

TDS - Total dissolved solids

4.3 PERMITTING REQUIREMENTS

4.3.1 Nevada Division of Environmental Protection – Underground Injection Control Program

An NDEP Long-Term Underground Injection Control (UIC) General Permit was required for the injection of biological carbon substrates and CPS into the saturated subsurface. A long-term UIC general permit with permit number GU07RL and authorization identification number 51056 was issued by NDEP on August 16, 2016. A copy of this permit is provided in Appendix F.

4.3.2 Nevada Division of Water Resources

For the wells associated with the biological reduction study located within the Central Retention Basin, a Notice of Intent (NOI) card and associated amendments from the State of Nevada, Department of Conservation and Natural Resources, Division of Water Resources (NOI #39157) were obtained for the installation of 6 injection wells and 12 monitoring wells. For the wells associated with the AP Area Up and Down Flushing Treatability Study that were used for the chemical reduction study, NOI cards (NOI #37995 and 37996) were obtained for the installation of 24 injection wells, 18 monitoring wells, and 8 extraction wells (the extraction wells were not used as part of the chemical reduction study and are associated with other activities being conducted as part of the AP Area Up and Down Flushing Treatability Study). Copies of NOI cards are provided in Appendix F.

4.4 HEALTH AND SAFETY

All field work was conducted in accordance with an Activity Hazard Analyses and other elements of the site-wide Health and Safety Plan, which addresses potential chemical and physical hazards associated with the field studies. Modified Level D personal protective equipment was required for all field activities. Available chemical fact sheets and safety data sheets had been incorporated into the Health and Safety Plan, and were made available on-Site at all times during field activities. No health and safety incidents occurred during the implementation of the biological and chemical reduction studies.

¹ Dissolved metals includes the following: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.

5.0 ANALYSIS OF RESULTS

This section examines results observed within the biological and chemical reduction study areas and provides a discussion of each of the significant geochemical parameters that were sampled during the treatability study timeframe. The relationships between each of these parameters are also evaluated and described herein.

Groundwater monitoring field logs from all groundwater sampling events are provided in Appendix E. Soil and groundwater analytical results for all groundwater parameters can be found in the comprehensive data tables provided as Appendix G and a data validation report is provided in Appendix H.

5.1 BIOLOGICAL REDUCTION STUDY

This section presents the soil, groundwater, and field parameter data collected as part of the biological reduction study. The most significant parameters that are discussed as part of the biological reduction study are hexavalent chromium, TOC, nitrate, chlorate, perchlorate, chloroform, sulfate and sulfide, metals, DO, and ORP, all of which are tabulated in individual tables presented within this section. A summary and analysis of the microbial results obtained from the Bio-Trap® sampling conducted as part of the biological reduction study is provided in Section 5.1.4. Additionally, a hydrogeological evaluation based on the results of groundwater gauging and aquifer testing is provided in Section 5.1.5.

5.1.1 Soil Analytical Results

As described in Section 4.1.3.2, soil samples were collected from each of the wells installed as part of the biological reduction study and analyzed for a variety of parameters to evaluate subsurface conditions prior to performing injections. Soil analytical results for the wells are summarized in the comprehensive soil data tables provided as Appendix G. A summary of these parameters and their significance are presented below:

- Hexavalent chromium concentrations in soil up to 60 feet bgs, the maximum depth investigated, ranged from non-detect to 22,000 micrograms per kilogram (μg/kg). Within the vadose zone, hexavalent chromium concentrations in soil were below 1,000 μg/kg. Within the saturated Qal, the average hexavalent chromium concentration in soil was 2,500 μg/kg, with a maximum hexavalent chromium concentration of 8,000 μg/kg. Within the UMCf, the average hexavalent chromium concentration in soil was 9,100 μg/kg, with a maximum hexavalent chromium concentration of 22,000 μg/kg. These results indicate that hexavalent chromium impacts are present within the saturated zone and that the majority of the hexavalent chromium mass is present within the UMCf.
- Total chromium concentrations in soil up to 60 feet bgs, the maximum depth investigated, ranged from 11,000 to 81,000 μg/kg. Within the vadose zone, the average total chromium concentration in soil was 19,000 μg/kg, with a maximum total chromium concentration of 57,000 μg/kg. Within the saturated Qal, the average total chromium concentration in soil was 35,000 μg/kg, with a maximum total chromium concentration of 58,000 μg/kg. Within the UMCf, the average total chromium concentration in soil was 42,000 μg/kg, with a maximum total chromium concentration of 81,000 μg/kg. These results indicate that the total chromium concentrations in the UMCf are generally higher than in the Qal.
- Perchlorate concentrations in soil up to 60 feet bgs, the maximum depth investigated, ranged from 700 to 4,900,000 μg/kg. Within the vadose zone, the average perchlorate concentration in soil was 662,000 μg/kg, with a maximum perchlorate concentration of 3,800,000 μg/kg. Within the saturated Qal, the average perchlorate concentration in soil was 1,438,000 μg/kg, with a maximum perchlorate concentration of 4,900,000 μg/kg. Within the UMCf, the average perchlorate concentration in soil was 559,000 μg/kg, with a maximum perchlorate concentration of 1,400,000 μg/kg. These results indicate

that the perchlorate concentrations in soil within the saturated Qal are generally higher than the within the UMCf.

- Chlorate concentrations in soil up to 60 feet bgs, the maximum depth investigated, ranged from non-detect to 4,000,000 μg/kg. Within the vadose zone, the average chlorate concentration in soil was approximately 8,000 μg/kg, with a maximum chlorate concentration of 26,000 μg/kg. Within the saturated Qal, the average chlorate concentration in soil was approximately 386,000 μg/kg, with a maximum chlorate concentration of 2,300,000 μg/kg. Within the UMCf, the average chlorate concentration in soil was approximately 2,210,000 μg/kg, with a maximum chlorate concentration of 4,000,000 μg/kg. These results indicate that the majority of the chlorate mass is present in the saturated zone and that the chlorate concentrations in soil within the saturated UMCf are generally higher than the within the Qal.
- Total organic carbon in the soil ranged from 1,700 to 34,000 mg/kg.
- The soil pH ranged from 7.6 to 8.7, with an average pH of 8.1. Soil alkalinity, reported as calcium carbonate, was analyzed from the water extract and ranged from 36 to 1,400 mg/L, with an average concentration of 323 mg/L. These results indicate that the soil is slightly alkaline.
- Average concentrations of soluble cations in soil, as analyzed from the water extract, were 241 mg/L for sodium, 10.6 mg/L for potassium, 24 mg/L for calcium, and 9.7 mg/L for magnesium. Average concentrations of soluble anions in soil were 146 mg/L for chloride, 176 mg/L for sulfate, and 115 mg/L for nitrate. TDS concentrations in soil, as analyzed from the water extract, ranged from 520 mg/L to 4,900 mg/L, with an average concentration of approximately 1,850 mg/L. These results, along with the perchlorate and chlorate results, indicate that the soils contain a high salt content.
- Arsenic concentrations in soil ranged from 17 to 37 mg/kg, with an average concentration of 24 mg/kg. Lead concentrations in soil ranged from 2.1 to 9.9 mg/kg, with an average concentration of 6.1 mg/kg. Additional metal concentrations are summarized in Appendix G.

Soil samples were also collected near the center of the proposed well screen interval in both the Qal and UMCf for physical parameter analysis. The average dry bulk density for the Qal soil samples was 1.37 grams per cubic centimeter (g/cc) with an average total porosity of 47.5%. The average vertical and horizontal hydraulic conductivity for the Qal soil samples was 3.21 x 10⁻⁴ cm/s and 4.63 x 10⁻⁴ cm/s, respectively. The average dry bulk density for the UMCf soil samples was 1.02 g/cc with an average total porosity of 61.2%. The average vertical and horizontal hydraulic conductivity for the UMCf soil samples was 3.5 x 10⁻⁶ cm/s and 6.4 x 10⁻⁶ cm/s, respectively. Physical parameter analytical results and laboratory reports are provided in Appendix G and Appendix I, respectively.

5.1.2 Groundwater Analytical Results

The following subsections present the groundwater analytical results for hexavalent chromium, TOC, nitrate, chlorate, perchlorate, chloroform, sulfate, sulfide, metals, and microbial data. Field parameters, consisting of DO, ORP, and pH are also discussed in detail. In addition, a subset of analytical results and field parameters, including TDS, alkalinity, chlorite, chloride, dissolved methane, total nitrogen, and volatile fatty acids (VFAs), are summarized here. For reference, monitoring wells CTMW-01 and CTMW-02 are located approximately 15 feet from the injection wells; CTMW-03, CTMW-04, and CTMW-06 are located approximately 34 feet from the injection wells; and CTMW-05 is located approximately 47 feet from the injection wells (Figure 3a).

5.1.2.1 Hexavalent Chromium

Hexavalent chromium was analyzed periodically throughout the treatability study to monitor changes in concentration from baseline values after injections in the Qal and UMCf to ascertain the effectiveness of the technology.

Shallow Wells

Groundwater results for the shallow monitoring wells screened in the Qal are summarized in *Table 4* and presented on Figure 7a.

Table 4 Hexavalent Chromium Groundwater Results in Shallow Wells – Biological Reduction Study

	Weeks	Hexavalent Chromium Concentration (mg/L)							
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Baseline	0	11	11	13	9.9	NS	NS		
	Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)								
PME #1	2	0.026	1.3	13	5.4	NS	NS		
PME #2	4	0.00025 U	0.110	14	0.150	NS	NS		
PME #3	6	0.00025 U	0.760	14	0.470	NS	NS		
	Са	rbon Substrat	e Injection Ev	ent #2 (6/6/1	7 – 6/9/17)				
PME #4	9	0.00025 U	0.00025U	4.4	0.00025 U	4.9	0.00025 U		
PME #5	13	0.00025 U	0.00025U	14	0.00034 J	2.5	0.00025 U		
	Ca	rbon Substrate	Injection Eve	ent #3 (8/7/17	7 – 8/11/17)				
PME #6	18	0.0026	Dry	4.8	0.00025 U	3.4	0.00025 U		
PME #7	22	0.00037 J	0.00025U	14	0.00025 U	2.3	0.00025 U		
PME #8	24	0.00025 U	0.00025U	16	0.00025 U	5.9	0.00025 U		

Notes:

mg/L – milligrams per liter

NS – not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME - Performance Monitoring Event

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

J - The result is an estimated quantity.

The baseline groundwater sampling event in April 2017 indicated that hexavalent chromium concentrations in groundwater within the Qal ranged from 9.9 to 13 mg/L within the biological reduction treatability study area.

Three performance monitoring events (PME #1 through PME #3) were performed approximately 2 weeks, 4 weeks, and 6 weeks following carbon substrate injection event #1. Hexavalent chromium concentrations in groundwater decreased at monitoring wells CTMW-01S, CTMW-02S, and CTMW-04S by approximately 99%, 93%, and 95%, respectively, when compared to the baseline concentrations. Groundwater concentrations at CTMW-03S, which is located cross-gradient of the injection wells, remained constant during this time period which may reflect the well's location outside of the ROI for carbon substrate injection event #1.

Carbon substrate injection event #2 was performed approximately 7 weeks after carbon substrate injection event #1. Additionally, monitoring wells CTMW-05S and CTMW-6S were installed during carbon substrate injection event #2. Two performance monitoring events (PME #4 and PME #5) were performed approximately 2 weeks and 6 weeks following carbon substrate injection event #2. Hexavalent chromium concentrations in groundwater were

non-detect or near non-detect at monitoring wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S during this time period. Hexavalent chromium decreased by 49% in groundwater at CTMW-05S, located cross-gradient of the injection wells, between PME #4 and PME #5. Additionally, hexavalent chromium concentrations decreased in groundwater at CTMW-03S from 14 mg/L during PME #3, prior to carbon substrate injection event #2, to 4.4 mg/L during PME #4, corresponding to an increase in TOC concentrations from 2.1 mg/L to 250 mg/L (Section 5.1.2.2). By PME #5, however, the hexavalent chromium concentration in groundwater at CTMW-03S increased to its pre-carbon substrate injection event #2 concentration, with a corresponding increase in ORP, which may be due to the concentration rebounding after the consumption of carbon substrate in proximity to these monitoring wells or migration of carbon substrate downgradient of these monitoring wells.

Carbon substrate injection event #3 was performed approximately 9 weeks after carbon substrate injection event #2. Three performance monitoring events (PME #6 through PME #8) were performed approximately 2 weeks, 6 weeks, and 8 weeks following carbon substrate injection event #3. Hexavalent chromium concentrations in groundwater remained non-detect or close to non-detect at monitoring wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S during this time period. Similar to after carbon substrate injection event #2, the hexavalent chromium concentration in groundwater at CTMW-03S decreased by a comparable amount and increased back to concentrations near those prior to the carbon substrate injection event #3. Hexavalent chromium concentrations in groundwater at CTMW-05S decreased from 3.4 mg/L to 2.3 mg/L between PME #6 and PME #7, but increased to 5.9 mg/L by PME #8.

In general, the groundwater in the Qal within the biological reduction study area responded favorably to biological reduction of hexavalent chromium following injection activities. Groundwater concentrations reached non-detect levels at each of the 4 downgradient monitoring wells, including the farthest downgradient monitoring well CTMW-06S. Although minimal overall hexavalent chromium changes in groundwater concentrations at monitoring wells CTMW-03S and CTMW-05Swere observed, these wells were the farthest side/cross-gradient wells in the study and likely slightly outside the injection influence necessary for sustained reduction. Hexavalent chromium concentrations in groundwater at CTMW-03S did exhibit slight fluctuations immediately following the second and third injection events, but these were temporary and correlate with intermittent fluctuations of TOC, which indicates that this well was likely on the fringe of the treatment zone. Based on the results, the treatment zone in the Qal was demonstrated to extend at least 34 feet downgradient of the injection wells. The lack of perchlorate reduction immediately following injections (Section 5.1.2.5), among other supporting factors, suggests that the chromium reductions observed in the Qal were associated with the creation of reducing conditions.

A maximum first-order degradation rate was calculated for the reduction in hexavalent chromium concentrations in groundwater at monitoring well CTMW-01S using the steepest decline of concentrations. The maximum first-order degradation rate for hexavalent chromium in the Qal was -0.37 day⁻¹.

Deep Wells

Groundwater results for deep monitoring wells screened in the UMCf are summarized in *Table 5* and presented on Figure 7b.

Table 5 Hexavalent Chromium Groundwater Results in Deep Wells – Biological Reduction Study

	Weeks		Hexavalent Chromium Concentration (mg/L)							
Event	Following 1 st Injection	CTMW- 01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D			
Baseline	0	24	20	17	19	NS	NS			
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)										
PME #1	2	22	15	16	16	NS	NS			
PME #2	4	21	19	16	19	NS	NS			
PME #3	6	22	19	15	19	NS	NS			
	Carb	on Substra	te Injection	Event #2 (6/	6/17 – 6/9/17	")				
PME #4	9	20 J-	16	15	19	16	15			
PME #5	13	16	13	14	19	15 J-	17			
	Carbo	on Substrat	e Injection I	Event #3 (8/7	7/17 – 8/11/1	7)				
PME #6	18	13	14	14	18	15	15			
PME #7	22	12	13	14	17	15	14			
PME #8	24	12	15	15	18	14	12			

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME - Performance Monitoring Event

J--The result is an estimated quantity, but the result may be biased low.

The baseline groundwater sampling event in April 2017 indicated that hexavalent chromium concentrations in the UMCf ranged from 17 to 24 mg/L within the biological reduction study area.

Three performance monitoring events (PME #1 through PME #3) were performed approximately 2 weeks, 4 weeks, and 6 weeks following carbon substrate injection event #1. Hexavalent chromium concentrations in groundwater at CTMW-01D through CTMW-04D fluctuated slightly throughout this time period, but remained close to baseline values likely due to the reduced hydraulic conductivity and groundwater flow velocity in the UMCf compared to the Qal.

Carbon substrate injection event #2 was performed approximately 7 weeks after carbon substrate injection event #2. Additionally, monitoring wells CTMW-05D and CTMW-6D were installed during carbon substrate injection event #2. Two performance monitoring events (PME #4 and PME #5) were performed approximately 2 weeks and 6 weeks following carbon substrate injection event #2. Hexavalent chromium concentrations in groundwater decreased slightly at monitoring wells CTMW-01D and CTMW-02D, which correlated to ORP and DO decreases and a TOC increase at both wells. Hexavalent chromium concentrations decreased slightly in groundwater at CTMW-03D as well; however, no TOC concentrations were observed at CTMW-03D indicating that the observed hexavalent chromium decrease may be due to natural fluctuations. No decreases were observed at the farther downgradient wells, CTMW-04D, CTMW-05D, and CTMW-06D.

Carbon substrate injection event #3 was performed approximately 9 weeks after carbon substrate injection event #2. Three performance monitoring events (PME #6 through PME #8) were performed approximately 2 weeks, 6 weeks, and 8 weeks following carbon substrate injection event #3. By PME #7, hexavalent chromium concentrations decreased in groundwater at monitoring wells CTMW-01D, CTMW-02D, CTMW-04D, and CTMW-06D, correlated to DO concentration decreases at each well. Additionally, TOC concentrations increased in groundwater at CTMW-01D, CTMW-04D, and CTMW-06D, indicating that substrate had reached these wells. By PME #8, however, hexavalent chromium concentrations in groundwater increased at CTMW-02D, CTMW-03D, and CTMW-04D and remained unchanged in groundwater at CTMW-01D and CTMW-06D. TOC concentrations in groundwater by PME #8 were only elevated compared to baseline values in groundwater at monitoring wells CTMW-01D and CTMW-06D. The hexavalent chromium concentrations in groundwater remained either unchanged or within the range of natural fluctuations for CTMW-03D and CTMW-05D during this time period, indicating that substrate had not propogated to these wells. In additon, the geochemical conditions favorable for chromium reduction were not observed at CTMW-03D and CTMW-05D.

Although hexavalent chromium concentrations in groundwater at each UMCf well were generally less than baseline concentrations, hexavalent chromium concentrations in groundwater within the UMCf did not decrease to the same degree that hexavalent chromium concentrations decreased in groundwater within the Qal. The limiting factors to hexavalent chromium reduction in the UMCf likely included the groundwater flow velocity and hydraulic conductivity, both of which were less than the Qal. This is demonstrated by the evaluation of hexavalent chromium concentrations in groundwater at the closest downgradient monitoring well CTMW-01D, which is located approximately 10 feet downgradient of the injection well CTIW-01D. Groundwater at his well exhibited an approximate 50% reduction in hexavalent chromium concentrations, which was the most significant reduction observed in groundwater at the deep monitoring wells. The lack of perchlorate reduction immediately following injections (Section 5.1.2.5), among other supporting factors, suggests that the chromium reductions observed in the UMCf were associated with the creation of reducing conditions.

A maximum first-order degradation rate was calculated for the reduction in hexavalent chromium concentrations in groundwater at monitoring well CTMW-01D using the steepest decline of concentrations. The maximum first-order degradation rate for hexavalent chromium in the UMCf was -0.005 day⁻¹.

5.1.2.2 Total Organic Carbon

Total organic carbon (TOC) is often used as a surrogate parameter to track the carbon substrate injectate in the groundwater. As previously explained, hexavalent chromium tends to be biologically stable under aerobic conditions or when there is a limited source of organic carbon. TOC is also used as an important indicator to determine the appropriate timing for reinjection activities. As a result, TOC was analyzed throughout the treatability study to monitor changes in carbon concentrations in groundwater from baseline and after injections.

Shallow Wells

TOC results for shallow monitoring wells are summarized in **Table 6** and presented on Figures 7a and 8a.

Table 6 Summary of TOC Groundwater Results in Shallow Wells – Biological Reduction Study

	Weeks	TOC Concentration (mg/L)									
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S				
Baseline	0	2.4	2.0	1.8	2.0	NS	NS				
	Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)										
PME #1	2	2,300	53	2.4	56	NS	NS				

	Weeks		١	OC Concen	OC Concentration (mg/L)					
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S			
PME #2	4	3,000	14	2.5	250	NS	NS			
PME #3	6	2,000	15	2.1	58	NS	NS			
Carbon Substrate Injection Event #2 (6/6/17 – 6/9/17)										
PME #4	9	6,600	1,500	250	170	8.6	730			
PME #5	13	9,000	2,300	5.4	320	7.1	3,100			
	Carb	on Substrat	e Injection I	Event #3 (8/7	7/17 – 8/11/1	7)				
PME #6	18	6,700	Dry	39	1,800	11	3,200			
PME #7	22	6,200	2,000	2.8	820	7.1	2,700			
	Carb	on Substrat	e Injection I	Event #3 (8/7	7/17 – 8/11/1	7)				
PME #8	24	6,300 J-	1,900 J-	2.6	140 J-	3.5	3,000			

mg/L - milligrams per liter

NS – not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME – Performance Monitoring Event

J--The result is an estimated quantity, but the result may be biased low.

The baseline groundwater sampling event in April 2017 indicated TOC concentrations in groundwater within the Qal between 1.8 and 2.4 mg/L throughout the treatability study area.

Based on the sampling data collected during PME #1 through PME #3, TOC concentrations increased by three orders of magnitude in groundwater at CTMW-01S and two orders of magnitude in groundwater at CTMW-02S and CTMW-04S. The TOC concentration increased slightly in groundwater at CTMW-03S during this time period, but based on the cross-gradient position of CTMW-03S, substrate propagation to this well was likely limited.

Based on the sampling data collected during PME #4 through PME #5, TOC concentrations in groundwater continued to increase at CTMW-01S, CTMW-02S, and CTMW-04S, indicating that substrate is propagating to these wells. In addition, the TOC concentration in groundwater at downgradient well CTMW-06S (sampled for the first time during PME #4) increased from 730 mg/L to 3,100 mg/L. The TOC concentration in groundwater at CTMW-03S increased by two orders of magnitude to 250 mg/L during PME #4, but decreased to 5.4 mg/L during PME #5, indicating that limited substrate is propagating to CTMW-03S due to its cross-gradient location. The TOC concentration of 8.6 mg/L in groundwater at CTMW-05S (sampled for the first time during PME #4) was slightly higher than the baseline sampling event, but the TOC concentration decreased to 7.1 mg/L during PME #5, indicating that the amount of substrate propagating to CTMW-05S was limited.

During events PME #6 through PME #8, TOC concentrations in groundwater at CTMW-01S and CTMW-02S increased by three orders of magnitude; TOC concentrations in groundwater at CTMW-04S increased by two orders of magnitude; and TOC concentrations in groundwater at CTMW-06S increased by one order of magnitude when compared to baseline conditions. Slight TOC concentration increases were detected in groundwater at CTMW-03S and CTMW-05S during PME #6, conducted after carbon substrate injection event #3, but TOC concentrations in groundwater declined during PME #7 and PME #8.

Deep Wells

TOC results for the deep monitoring wells are summarized in *Table 7* and Figures 7b and 8b.

Table 7 Summary of TOC Groundwater Results in Deep Wells – Biological Reduction Study

	Weeks		1	OC Concen	tration (mg/	L)				
Event	Following 1 st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D			
Baseline	0	4.1	3.7	2.7	5.7	NS	NS			
	Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	8.0	12	3.0	2.9	NS	NS			
PME #2	4	9.8	11	2.5	3.4	NS	NS			
PME #3	6	16	6.2	2.0	3.0	NS	NS			
	Carbo	on Substrat	e Injection I	Event #2 (6/0	6/17 – 6/9/17)					
PME #4	9	11	90	2.2	2.6	3.5	3.5			
PME #5	13	66	150	2.0	2.4	2.3	4.9			
	Carbo	n Substrate	Injection E	vent #3 (8/7	/17 – 8/11/17)				
PME #6	18	350	17	2.0	2.8	2.6	25			
PME #7	22	430	8.6	1.9	3.3	2.3	85			
PME #8	24	440 J-	7.8	2.8	3.7	2.3	120			

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME - Performance Monitoring Event

J--The result is an estimated quantity, but the result may be biased low.

The baseline groundwater sampling event in April 2017 indicated TOC concentrations in groundwater within the UMCf between 2.7 mg/L and 5.7 mg/L. No TOC concentration increases in groundwater were observed when compared to baseline during PME #1 through PME #3, indicating that substrate had not propagated to these wells during this time period. During PME #4 through PME #5, TOC increased in groundwater by an order of magnitude above baseline at CTMW-01D and CTMW-02D, the two closest wells to the injection wells. TOC concentrations generally continued to increase in groundwater at CTMW-01D and CTMW-06D during events PME #6 through PME #8, indicating that substrate was propagating to both wells. TOC concentrations decreased in groundwater at CTMW-02D and remained generally stable in groundwater at CTMW-03D, CTMW-04D, and CTMW-05D, indicating that substrate had not propagated to these wells.

Upon completion of PME #8, TOC concentrations in groundwater within the shallow wells were generally higher than TOC concentrations in groundwater within the deep wells, although TOC concentrations in groundwater at cross-gradient well clusters CTMW-03 and CTMW-05 were generally similar. The overall pattern of substrate propagation based on TOC concentrations in groundwater was similar between well clusters CTMW-01, CTMW-02, and CTMW-06, indicating that well position was a significant factor affecting substrate distribution. The highest TOC concentrations were associated with monitoring wells located in the closest proximity to injection wells

(CTMW-01S/D and CTMW-02S/D) or the downgradient monitoring well (CTMW-06S/D), indicating that substrate propagation generally followed the groundwater flow direction for the treatability study area and lateral dispersion was limited.

5.1.2.3 Nitrate

Nitrate concentrations were evaluated throughout the study since it is a competing electron acceptor and carbon substrate consumer.

Shallow Wells

Nitrate results for shallow monitoring wells are summarized in *Table 8* and presented on Figure 8a.

Table 8 Summary of Nitrate Groundwater Results in Shallow Wells – Biological Reduction Study

	Weeks		Nitrate Concentration (mg/L)						
Event	Following 1 st Injection	CTMW-01S	CTMW- 02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Baseline	0	120	160	55	150	NS	NS		
	Carbo	n Substrate	Injection I	Event #1 (4/1	8/17 – 4/21/1	7)			
PME #1	2	210	540	27	120	NS	NS		
PME #2	4	55	530	31	93	NS	NS		
PME #3	6	2.6	320	38	51	NS	NS		
	Carb	on Substrat	te Injection	Event #2 (6/	6/17 – 6/9/17	')			
PME #4	9	9.5	1.1 U	34	18	60	1.1 U		
PME #5	13	0.55 U	0.63 J	30	1.1 U	24	1.2 J		
	Carbo	on Substrat	e Injection	Event #3 (8/7	7/17 – 8/11/1	7)			
PME #6	18	4.8 J	Dry	17	1.1 U	32	1.1 U		
PME #7	22	1.1 U	0.28 U	26	1.1 U	14	1.1 U		
PME #8	24	0.55 U	1.1 U	26	5.3 J	28	2.8 U		

Notes:

mg/L - milligrams per liter

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

NS – not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME – Performance Monitoring Event

J - The result is an estimated quantity.

The baseline groundwater sampling event in April 2017 indicated nitrate concentrations (reported as nitrate-nitrogen) in groundwater ranging from 55 to 160 mg/L at the shallow wells within the treatability study area.

Based on sampling data collected during PME #1 through PME #3, a general decrease in nitrate concentrations in groundwater was observed at monitoring wells CTMW-01S, CTMW-03S, and CTMW-04S by approximately 98%, 31%, and 66%, respectively, during this time period when compared to baseline concentrations. The nitrate concentration in groundwater at CTMW-02S tripled by PME #2 and then slightly decreased by PME #3 when compared to baseline concentrations, but this increase may be the result of natural fluctuation.

Based on sampling data collected during PME #4 through PME #5, nitrate concentrations in groundwater continued to exhibit an overall decreasing trend when compared to baseline concentrations at CTMW-01S, CTMW-02S, CTMW-03S, CTMW-04S, and CTMW-05S. The greatest nitrate concentration decrease was

observed in groundwater at CTMW-02S, which decreased by approximately 99% when compared to the PME #3 concentration. Nitrate concentrations achieved non-detect levels in groundwater at four wells during these events.

Based on sampling data collected during PME #6 through PME #8, slight fluctuations in nitrate concentrations in groundwater were observed at each monitoring well. Nitrate concentrations in groundwater detected during these events, however, were consistently less than baseline concentrations, indicating that denitrification was occurring in the biological reduction study area. The nitrate concentration in groundwater at CTMW-06S was the exception, as the nitrate concentration detected during PME #8 was slightly higher than the baseline concentration (non-detect; collected during PME #4).

Nitrate concentrations detected in groundwater at CTMW-06S generally remained very low or non-detect from PME #4 through PME #8. Nitrate concentrations in groundwater at CTMW-03S and CTMW-05S decreased when compared to baseline, but nitrate concentrations in groundwater at CTMW-03S and CTMW-05S were an order of magnitude higher than CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S at the completion of performance monitoring. The magnitude of the nitrate concentration decreases in groundwater at CTMW-03S and CTMW-05S is likely related to the side-gradient position of both wells that would almost certainly result in a reduced amount of substrate that would propagate to these wells, which is evidenced by low TOC concentrations.

Deep Wells

Nitrate results for the deep monitoring wells are summarized in *Table 9* and presented on Figure 8b.

Table 9 Summary of Nitrate Groundwater Results in Deep Wells – Biological Reduction Study

	Weeks							
Event	Following 1 st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D	
Baseline	0	20	34	47	26	NS	NS	
	Carbo	n Substrate	Injection E	vent #1 (4/18	B/17 – 4/21/1	7)		
PME #1	2	21	30	48	33	NS	NS	
PME #2	4	22	26	41	32	NS	NS	
PME #3	6	20	25	34	31	NS	NS	
	Carb	on Substrat	e Injection I	Event #2 (6/0	6/17 – 6/9/17)		
PME #4	9	17	22	33	33	73	97	
PME #5	13	14	5.8	27	34	64 J+	84	
	Carbo	n Substrate	Injection E	vent #3 (8/7	/17 – 8/11/17)		
PME #6	18	9.9	18	23	36	52	52	
PME #7	22	12	14	23	36	52	48	
PME #8	24	11	17	24	38	48	41	

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME - Performance Monitoring Event

J+ - The result is an estimated quantity, but the result may be biased high.

The baseline groundwater sampling event in April 2017 indicated nitrate concentrations (reported as nitrate-nitrogen) ranged from 20 mg/L to 47 mg/L in groundwater adjacent to the deep wells within the treatability study area.

Based on sampling data collected during PME #1 through PME #3, nitrate concentrations were generally stable in groundwater at CTMW-01D, decreased in groundwater at CTMW-02D and CTMW-03D, and slightly increased in groundwater at CTMW-04D. A correlation between decreasing nitrate concentrations and decreasing chlorate concentrations in groundwater was observed in CTMW-02D from PME #1 to PME #3, but perchlorate concentrations did not exhibit the same correlation.

Based on the sampling data collected during PME #4 through PME #5 (following the second injection event), nitrate concentrations decreased in groundwater at CTMW-01D, CTMW-02D, CTMW-03D, CTMW-05D, and CTMW-06D. The greatest nitrate concentration decrease in groundwater was observed at CTMW-02D, which decreased by approximately 77% when compared to its PME #3 concentration. Nitrate concentration decreases in groundwater at CTMW-01D and CTMW-02D correlated to increases in TOC at both wells observed during this time period.

Although slight fluctuations in nitrate concentrations were observed in groundwater at CTMW-01D, CTMW-02D, CTMW-03D, CTMW-05D, and CTMW-06D during PME #6 through PME #8, overall, nitrate concentrations in groundwater at each of these five wells during PME #8 were significantly less than the corresponding baseline concentration. Groundwater collected from CTMW-04D continued to exhibit a slightly increasing trend in nitrate concentrations during this time period, indicating that appreciable rates of denitrification were not occurring at this well.

Overall, nitrate concentrations in groundwater at several of the downgradient monitoring wells showed a marked decrease compared to baseline concentrations. Nitrate concentrations in groundwater at the closest downgradient monitoring wells, CTMW-01D, CTMW-02D, and CTMW-03D decreased by 45%, 50%, and 49%, respectively. Nitrate concentrations in groundwater at the downgradient wells CTMW-05D and CTMW-06D decreased by 34% and 58%, respectively.

5.1.2.4 Chlorate

Generally, chlorate biodegradation precedes perchlorate biodegradation, although the two processes can also occur simultaneously, particularly in the presence of organic carbon. As a result, chlorate was monitored to assess potential secondary impacts of treatment.

Shallow Wells

Chlorate results for shallow monitoring wells are summarized in *Table 10* and presented on Figure 8a.

Table 10 Summary of Chlorate Groundwater Results in Shallow Wells - Biological Reduction Study

	Weeks	Chlorate Concentration (mg/L)								
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S			
Baseline	0	2,500	2,500	2,900	2,500	NS	NS			
	Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	870	860	3,200	1,800	NS	NS			
PME #2	4	730	550	3,200	910	NS	NS			
PME #3	6	650	750	4,000	1,100	NS	NS			

	Weeks		Chlorate Concentration (mg/L)						
Event	Following 1st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Carbon Substrate Injection Event #2 (6/6/17 – 6/9/17)									
PME #4	9	64	0.50 U	1,600	290	2,100	20		
PME #5	13	72	0.50 U	3,100	20	1,700	19		
	Carbo	on Substrat	e Injection I	Event #3 (8/	7/17 – 8/11/1	7)			
PME #6	18	13	Dry	1,600	16	2,000	0.29		
PME #7	22	1.0 U	1.0 U	3,400	5.1	1,900	0.50 U		
PME #8	24	0.61	0.50 U	3,400	320	2,700	1.0 U		

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME - Performance Monitoring Event

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

The baseline groundwater sampling event in April 2017 indicated that chlorate concentrations in groundwater within the Qal ranged from 2,500 mg/L to 2,900 mg/L within the treatability study area. Based on sampling data collected during PME #1 through PME #3, chlorate concentrations in groundwater at CTMW-01S, CTMW-02S, and CTMW-04S dropped by approximately 74%, 70%, and 56%, respectively, during this time period. Chlorate concentrations in groundwater either remained low or continued to decrease in these wells during PME #4 and PME #5, while also observing decreases in CTMW-05S and CTMW-06S during this time period. The chlorate concentration in groundwater at CTMW-03S decreased during PME #4, but rebounded during PME #5 to a concentration above baseline.

Chlorate concentrations during events PME #6 through PME #8 decreased to the lowest concentrations observed during the study, with non-detect results at two of the wells and overall decreases in groundwater as much as 99% when compared to baseline. Although fluctuations occurred in some wells, chlorate concentrations remained below baseline concentrations in groundwater at all wells except CTMW-05S and CTMW-03S (which are believed to be at fringe of the area impacted by in-situ treatment).

A maximum first-order degradation rate was calculated for the reduction in chlorate concentrations in groundwater at monitoring well CTMW-02S using the steepest decline of concentrations. The maximum first-order degradation rate for chlorate in the Qal was -0.10 day⁻¹.

Deep Wells

Chlorate results for the deep monitoring wells are summarized in *Table 11* and presented on Figure 8b.

Table 11 Summary of Chlorate Groundwater Results in Deep Wells – Biological Reduction Study

Event	Weeks	Chlorate Concentration (mg/L)							
	Following 1 st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D		
Baseline	0	4,900	4,800	3,700	4,300	NS	NS		
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	4,900	4,200	3,500	4,200	NS	NS		

	Weeks		Chlorate Concentration (mg/L)						
Event	Following 1 st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D		
PME #2	4	4,500	4,000	3,400	4,000	NS	NS		
PME #3	6	4,800	3,300	3,500	4,700	NS	NS		
Carbon Substrate Injection Event #2 (6/6/17 – 6/9/17)									
PME #4	9	4,300	2,000	3,400	3,700	3,400	4,000		
PME #5	13	4,100	4,400	3,400	4,600	3,400	3,900		
	Carbo	on Substrat	e Injection I	Event #3 (8/7	7/17 – 8/11/17	7)			
PME #6	18	3,700	3,500	3,200	4,100	3,500	3,700		
PME #7	22	3,800	3,700	3,400	3,500	3,300	2,700		
PME #8	24	3,500	3,600	3,500	3,900	3,400	3,100		

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME – Performance Monitoring Event

The baseline groundwater sampling event in April 2017 indicated that chlorate concentrations in groundwater within the UMCf ranged from 3,700 mg/L to 4,900 mg/L within the treatability study area. Based on sampling data collected during PME #1 through PME #3, chlorate concentrations in groundwater decreased in CTMW-02D when compared to baseline, while chlorate concentrations fluctuated in remaining wells. In remaining events throughout the study, chlorate concentrations generally did not exhibit a significant decrease in the groundwater within the UMCf, with the exception of groundwater adjacent to CTMW-01D where concentrations decreased from 4,900 mg/L in baseline to 3,500 mg/L in PME #8 (29% reduction). Remaining changes to chlorate concentration were likely a result of natural fluctuation. Based on observed TOC concentrations (Section 5.1.2.2), the volume of substrate in each well was likely a limiting factor to chlorate reduction in in groundwater at each well.

A maximum first-order degradation rate was calculated for the reduction in chlorate in groundwater at monitoring well CTMW-01D using the steepest decline of concentrations. The maximum first-order degradation rate for chlorate in the UMCf was -0.002 day⁻¹.

5.1.2.5 Perchlorate

Perchlorate was analyzed periodically throughout the treatability study to monitor changes in concentration from baseline values after injections in the shallow (Qal) and deep (UMCf) wells to ascertain perchlorate degradation as a potential beneficial byproduct of the technology.

Shallow Wells

Groundwater results for shallow monitoring wells are summarized in Table 12 and presented on Figure 8a.

Table 12 Perchlorate Groundwater Results in Shallow Wells – Biological Reduction Study

Event	Weeks						
	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S
Baseline	0	410	410	470	420	NS	NS

	Weeks		Per	chlorate Co	ncentration (mg/L)			
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	340	460	460	420	NS	NS		
PME #2	4	280	380	510	570	NS	NS		
PME #3	6	140	440	610	650	NS	NS		
	Carb	on Substra	te Injection	Event #2 (6/	6/17 – 6/9/17	")			
PME #4	9	39	110	670	560	560	460		
PME #5	13	4	26	540	180	570	18 J-		
	Carbo	on Substrat	e Injection I	Event #3 (8/	7/17 – 8/11/1	7)			
PME #6	18	32	Dry	600	140	610	13		
PME #7	22	0.32	13	540	510	570	0.010 U		
PME #8	24	0.15 J+	0.29	560	120	570	0.025 U		

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME - Performance Monitoring Event

J--The result is an estimated quantity, but the result may be biased low.

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

J+ – The result is an estimated quantity, but the result may be biased high.

The baseline groundwater sampling event in April 2017 indicated that perchlorate concentrations in groundwater within the Qal ranged from 410 to 470 mg/L within the treatability study area.

Three performance monitoring events (PME #1 through PME #3) were performed approximately 2 weeks, 4 weeks, and 6 weeks following carbon substrate injection event #1. By PME #3, the perchlorate concentration decreased in groundwater at monitoring well CTMW-01S by approximately 66%. The perchlorate concentration in groundwater at CTMW-02S decreased slightly by the time of PME #2, following decreases in chlorate, nitrate, and ORP, indicating that geochemical conditions favorable to perchlorate degradation were beginning to be established. However, perchlorate concentrations in groundwater increased at CTMW-02S by PME #3, which generally correlated to increases in chlorate and nitrate concentrations as well as ORP. Perchlorate concentrations in groundwater at CTMW-03S and CTMW-04S generally increased during this time period with generally correlated increases in chlorate, nitrate, and ORP. The perchlorate concentration increases in groundwater at CTMW-03S, and CTMW-04S may be due to concentrations rebounding after the consumption of carbon substrate in the proximity of these monitoring wells or migration of carbon substrate downgradient of these monitoring wells.

Carbon substrate injection event #2 was performed approximately 7 weeks after carbon substrate injection event #1. Additionally, monitoring wells CTMW-05S and CTMW-6S were installed during carbon substrate injection event #2. Two performance monitoring events (PME #4 and PME #5) were performed approximately 2 weeks and 6 weeks following carbon substrate injection event #2. During this time period, perchlorate concentrations in groundwater decreased at all shallow monitoring wells, with the exception of CTMW-05S, and generally correlated to decreases in chlorate and nitrate concentrations as well as ORP, which were indicative of geochemical conditions favorable for perchlorate reduction. Perchlorate concentrations in groundwater at monitoring wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S decreased by 90%, 76%, 67%, and

96%, respectively. The perchlorate concentration in groundwater at CTMW-05S increased, but chlorate and nitrate concentrations in groundwater decreased during this time period, indicating that reducing conditions were not sustained for a sufficient time period for perchlorate reduction to occur.

Carbon substrate injection event #3 was performed approximately 9 weeks after carbon substrate injection event #2. Three performance monitoring events (PME #6 through PME #8) were performed approximately 2 weeks, 6 weeks, and 8 weeks following carbon substrate injection event #3. By the time of PME #8, perchlorate concentrations in groundwater decreased at monitoring wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S when compared to concentrations prior to carbon substrate injection event #3. A direct correlation between decreasing nitrate and chlorate concentrations and decreasing perchlorate concentrations in groundwater at these wells was not exhibited during this time period, but ORP measurements indicated that geochemical conditions were favorable for perchlorate reduction at each well. Perchlorate concentrations increased slightly in groundwater at CTMW-03S and CTMW-05S immediately following carbon substrate injection event #3, but decreased to concentrations generally consistent with those prior to carbon substrate injection event #3 by the time of PME #8.

A maximum first-order degradation rate was calculated for the reduction in perchlorate concentrations in groundwater at monitoring well CTMW-01S using the steepest decline of concentrations. The maximum first-order degradation rate for perchlorate in the Qal was -0.05 day⁻¹.

Deep Wells

Groundwater results for deep monitoring wells are summarized in Table 13 and presented on Figure 8b.

Weeks Perchlorate Concentration (mg/L) **Event Following** CTMW-02D CTMW-06D CTMW-01D CTMW-03D CTMW-04D CTMW-05D 1st Injection Baseline 0 1,400 960 530 980 NS NS Carbon Substrate Injection Event #1 (4/18/17 - 4/21/17) 2 **PME #1** 490 NS 1,400 1,100 J 950 NS 4 520 870 NS NS PME #2 1,400 1,100 **PME #3** 6 1,300 1,300 570 890 NS NS Carbon Substrate Injection Event #2 (6/6/17 - 6/9/17) PME #4 9 1,400 1,100 520 990 660 1,000 **PME #5** 13 1,400 950 580 950 510 920 Carbon Substrate Injection Event #3 (8/7/17 – 8/11/17) PME #6 18 1,400 1,200 610 780 550 950

Table 13 Perchlorate Groundwater Results in Deep Wells – Biological Reduction Study

PME #8 Notes:

PME #7

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

22

24

1,500

1,300

PME - Performance Monitoring Event

J - The result is an estimated quantity.

The baseline groundwater sampling event in April 2017 indicated that perchlorate concentrations in groundwater within the UMCf ranged from 530 mg/L to 1,400 mg/L within the treatability study area. Perchlorate concentrations fluctuated throughout treatability study; however, no significant reduction was observed during the 6 month

540

540

820

740

2,500

1,200

800

970

550

650

monitoring period. Perchlorate is expected to biodegrade after hexavalent chromium, nitrate, and chlorate. As discussed previously, hexavalent chromium, nitrate, and chlorate were just starting to degrade in the closest downgradient monitoring wells by the end of PME #8.

5.1.2.6 Chloroform

As discussed in Section 2.1, chloroform is also amendable to in-situ biological reduction and is expected to be reduced following the reduction of nitrate (Bouwer & McCarty, 1983). However, additional testing is warranted to determine the exact sequence due to presence of high TDS concentrations at the Site.

Shallow Wells

Chloroform results from PME for shallow monitoring wells are summarized in Table 14.

Table 14 Chloroform Groundwater Results in Shallow Wells – Biological Reduction Study

	Weeks		Chloroform Concentration (mg/L)						
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Baseline	0	0.85	0.95	0.93	0.72	NS	NS		
	Carbo	n Substrate	Injection E	vent #1 (4/1	8/17 – 4/21/1	7)			
PME #1	2	0.42	0.62	1.1	0.81	NS	NS		
PME #2	4	0.34	0.42	0.97	0.64	NS	NS		
PME #3	6	0.23	0.52	1.2	0.61	NS	NS		
	Carb	on Substra	te Injection	Event #2 (6/	/6/17 – 6/9/17	')			
PME #4	9	0.14	0.21	0.92	0.59	0.96	0.67		
PME #5	13	0.13	0.18	1.3	0.62	1.1	0.61		
	Carbo	on Substrat	e Injection I	Event #3 (8/	7/17 – 8/11/1	7)			
PME #6	18	0.086	Dry	0.90	0.52	0.75	0.32		
PME #7	22	0.019 J	0.078	0.51	0.067	0.41	0.17 J-		
PME #8	24	0.025 R	0.013 J-	0.70	0.048	0.63	0.12 J-		

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME – Performance Monitoring Event

J- – The result is an estimated quantity, but the result may be biased low.

R – The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

The baseline groundwater sampling event performed in April 2017 indicated the chloroform concentrations in groundwater within the Qal ranged from 0.72 mg/L to 0.95 mg/L within the treatability study area.

Based on sampling data collected during PME #1 through PME #3, chloroform concentrations in groundwater decreased by approximately 45%, 16%, and 25% at downgradient wells CTMW-01S, CTMW-02S, and CTMW-04S when compared to baseline.

Chloroform concentrations continued to decrease in groundwater at CTMW-01S and CTMW-02S, the two closest downgradient wells to the injection wells, during the subsequent events PME #4 and PME #5. The chloroform concentration in groundwater at CTMW-06S decreased slightly from PME #4 to PME #5, but the decrease was not outside of the range of natural fluctuation.

Data collected during PME #6 through PME #8 indicated a reduction in chloroform concentrations between approximately 82% and 99% when compared to baseline in groundwater at downgradient shallow wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S. Chloroform concentrations in groundwater at cross-gradient shallow wells (CTMW-03S and CTMW-05S) decreased by approximately 25% and 34% when compared to baseline.

A maximum first-order degradation rate was calculated for the reduction in chloroform concentrations in groundwater at monitoring well CTMW-01S using the steepest decline of concentrations. The maximum first-order degradation rate for chloroform in the Qal was -0.02 day⁻¹.

Deep Wells

Chloroform results from PME for deep monitoring wells are summarized in Table 15.

Table 15 Chloroform Groundwater Results in Deep Wells – Biological Reduction Study

	Weeks		Chloroform Concentration (mg/L)						
Event	Following 1st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D		
Baseline	0	1.8	1.5	0.88	1.6	NS	NS		
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	1.7	1.5	1.3	1.4	NS	NS		
PME #2	4	1.7	1.3	1.1	1.6	NS	NS		
PME #3	6	1.8	1.9	1.4	1.6	NS	NS		
	Carb	on Substrat	e Injection	Event #2 (6/	6/17 – 6/9/17)			
PME #4	9	1.6	1.5	1.2	1.6	1.3	1.5		
PME #5	13	1.7	1.6	1.3	1.7	1.3	1.7		
	Carbo	on Substrate	e Injection E	Event #3 (8/7	7/17 – 8/11/17	7)			
PME #6	18	1.5	1.4	1.1	1.7	1.2	1.4		
PME #7	22	1.5	1.5	1.1	1.4	0.63	1.2		
PME #8	24	1.3	1.5	1.0	1.3	1.0	1.2		

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME – Performance Monitoring Event

The baseline groundwater sampling event performed in April 2017 indicated that chloroform concentrations in groundwater within the UMCf ranged from 0.88 mg/L to 1.8 mg/L within the treatability study area. Based on sampling data collected, the reduction in chloroform was not as significant as in groundwater in the shallow wells. Chloroform concentrations decreased in groundwater between approximately 19% and 28%at deep downgradient wells CTMW-01D, CTMW-04D, and CTMW-06D and by approximately 23% at deep cross-gradient well CTMW-05D, but the minor reduction in concentrations may be due to natural fluctuations.

A maximum first-order degradation rate was calculated for the reduction in chloroform concentrations in groundwater at monitoring well CTMW-01D using the steepest decline of concentrations. The maximum first-order degradation rate for chloroform in the UMCf was -0.002 day⁻¹.

5.1.2.7 Sulfate and Sulfide

Groundwater within the treatability study area has high native sulfate concentrations. Generally, sulfate reduction occurs only under very reducing conditions and after hexavalent chromium, nitrate, perchlorate, and chlorate reduction has occurred. Sulfide is a product of sulfate reduction and measurements of sulfide concentrations in groundwater can be used in conjunction with pH and ORP changes and changes in ferrous iron concentrations to understand if sulfate reduction is occurring.

Shallow Wells

Sulfate results for the shallow monitoring wells are summarized in *Table 16*. Sulfide concentrations are provided in Appendix G.

Table 16 Summary of Sulfate Groundwater Results in Shallow Wells – Biological Reduction Study

	Weeks		Sulfate Concentration (mg/L)							
Event	Following 1st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S			
Baseline	0	1,400	1,500	1,500	1,500	NS	NS			
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)										
PME #1	2	1,400	1,500	1,600	1,500	NS	NS			
PME #2	4	1,200	1,400	1,500	1,400	NS	NS			
PME #3	6	1,100	1,500	1,500	1,400	NS	NS			
	Car	bon Substra	ate Injection	Event #2 (6/	6/17 – 6/9/17)				
PME #4	9	740	890	1,600	1,500	1,400	950			
PME #5	13	140	29	1,600	1,100	1,400	230			
	Cark	on Substra	te Injection	Event #3 (8/7	7/17 – 8/11/17	7)				
PME #6	18	1,000	Dry	1,400	190	1,400	14			
PME #7	22	130 U	17	1,500	390 J+	1,300	5.0			
PME #8	24	76	6.5 J	1,500	920	1,400	13 U			

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME – Performance Monitoring Event

U – The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

J+ – The result is an estimated quantity, but the result may be biased high.

J - The result is an estimated quantity.

The baseline groundwater sampling event in April 2017 indicated sulfate concentrations in groundwater within the Qal between 1,400 mg/L and 1,500 mg/L. Sulfate concentrations in groundwater only decreased slightly at CTMW-01S when compared to baseline during PME #1 through PME #3. Data collected during the subsequent PME #4 and PME #5 continued to show sulfate decreases in groundwater at CTMW-01S. Decreases were also observed in groundwater at CTMW-02S, CTMW-04S, and CTMW-06S, corresponding to the establishment of geochemical conditions favorable for perchlorate reduction during this time period. During the final sampling events (PME #6 through PME #8), sulfate concentrations continued to decrease in groundwater at CTMW-01S, CTMW-02S, and CTMW-06S. Sulfide concentrations (Appendix G) remained relatively low in groundwater within the Qal during the treatability study, with the exception of groundwater at CTMW-01S, where concentrations

49

increased to 3.9 mg/L during PME #3 and at CTMW-06S, where concentrations increased to 7.3 mg/L during PME #5. The decrease in sulfate concentrations in groundwater indicate sulfate reduction was occurring and highly reducing conditions were present in the treatment zone.

Deep Wells

Sulfate results for the deep monitoring wells are summarized in *Table 17*. Sulfide concentrations are provided in Appendix G.

Table 17 Summary of Sulfate Groundwater Results in Deep Wells – Biological Reduction Study

	Weeks							
Event	Following 1 st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D	
Baseline	0	1,900	1,700	1,600	1,700	NS	NS	
	Carbo	n Substrate	Injection E	vent #1 (4/1	8/17 – 4/21/1	7)		
PME #1	2	1,800	1,700	1,600	1,700	NS	NS	
PME #2	4	1,700	1,500	1,500	1,500	NS	NS	
PME #3	6	1,600	1,600	1,500	1,600	NS	NS	
	Carb	on Substra	te Injection	Event #2 (6/	6/17 – 6/9/17)		
PME #4	9	1,700	1,600	1,600	1,700	1,400	1,500	
PME #5	13	1,700	1,300	1,500	2,200	1,500	1,500	
	Carbo	on Substrat	e Injection I	Event #3 (8/7	7/17 – 8/11/1 ⁻	7)		
PME #6	18	1,700	1,600	1,500	1,600	1,500	1,400	
PME #7	22	1,600	1,400	1,500	1,600	1,500	1,500	
PME #8	24	1,600	1,500	1,500	1,500	1,500	1,400	

Notes:

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME – Performance Monitoring Event

The baseline groundwater sampling event in April 2017 indicated sulfate concentrations in groundwater within the UMCf were between 1,600 and 1,900 mg/L. Based on the sampling data collected during PME #1 through PME #8, sulfate concentrations decreased slightly in groundwater at all of the monitoring wells when compared to baseline or initial sampling conditions, but was likely consistent with natural fluctuation in concentrations. Sulfide was rarely detected in groundwater within the UMCf at a concentration above the laboratory reporting, which correlates with the data indicating that sulfate was not reduced in the UMCf during the study.

5.1.2.8 Metals

As presented in Table 2, a suite of dissolved metals were sampled in groundwater as part of the baseline and performance monitoring events during the treatability study. Total chromium and total manganese (unfiltered) concentrations were also sampled as part of the baseline and performance monitoring events for groundwater, and total iron concentrations were sampled as part of performance monitoring events PME #3 through PME #8. Field measurements for ferrous iron were also collected as part of baseline and performance monitoring events. A focused evaluation of concentration changes of three redox sensitive metals (arsenic, iron, and manganese) is discussed here for the Qal and UMCf. Results of each parameter analyzed are presented in the comprehensive data tables provided in Appendix G.

Arsenic is sometimes released from minerals in the saturated subsurface when reducing conditions are created following the injection of a carbon substrate. The potential release of arsenic and its increase in concentration over time, therefore, were important to the treatability study. The baseline groundwater sampling event conducted in April 2017 indicated that dissolved arsenic concentrations in groundwater within the Qal ranged from 0.065 mg/L to 0.12 mg/L in the treatability study area. Arsenic concentrations in the shallow monitoring wells fluctuated in response to modified geochemical conditions in the aquifer during performance monitoring. At the end of performance monitoring, increases in arsenic concentrations in groundwater that have the potential to be outside of natural fluctuation were observed at CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-05S when compared to baseline concentrations, with the highest groundwater concentration of 0.91 mg/L at CTMW-01S.

The baseline groundwater sampling event conducted in April 2017 indicated that arsenic concentrations in groundwater within the deep monitoring wells ranged from non-detect to 0.100 mg/L in the treatability study area. Arsenic concentrations in deep monitoring wells fluctuated in response to geochemical conditions in the aquifer during performance monitoring. At the end of performance monitoring, increases in arsenic concentrations that have the potential to be outside of natural fluctuation were observed in groundwater at CTMW-02D, CTMW-04D, CTMW-05D, and CTMW-06D when compared to baseline concentrations, with the highest concentration of 0.130 mg/L in groundwater at CTMW-05D.

Generally, increases in arsenic concentrations in groundwater tend to be localized within the area and influence of carbon substrate injection. Once original groundwater conditions return within the reducing area, or when groundwater from the reducing area flows downgradient into areas with no impact, arsenic concentrations tend to return to previous concentrations (The Interstate Technology & Regulatory Council, 2008). Also, when TOC concentrations in the injection area decline, arsenic concentrations in groundwater are expected to decline and minimal arsenic will be released from sediments (Borden, et al., 2015). Therefore, at downgradient locations, where TOC concentrations in groundwater are much lower than at the injection well vicinity, there is much less potential for arsenic release. Furthermore, the presence of sulfate and biogenic sulfide generation under reducing conditions also tend to precipitate and immobilize arsenic over time as metal sulfides (Borden, et al., 2015). Because the area of the biological reduction study is at a considerable distance upgradient of a receiving body of water, it is quite unlikely that temporal increases in arsenic in groundwater in this immediate vicinity will impact arsenic concentrations farther downgradient at critical locations. Supplemental groundwater monitoring is recommended to confirm concentrations of arsenic in groundwater decrease as the geochemical conditions return to baseline conditions.

Under anaerobic conditions, iron can be reduced, mobilized, and precipitated out into the aquifer, a phenomenon that can sometimes decrease hydraulic permeability in the aquifer. For the shallow wells, the baseline groundwater sampling event conducted in April 2017 indicated that dissolved iron concentrations were not detected at a concentration above the laboratory reporting limit. Groundwater collected from each of the six shallow monitoring wells had measurable concentrations of dissolved and total iron that fluctuated throughout the performance monitoring events. The highest concentrations of total and dissolved iron in groundwater were consistently measured at CTMW-01S and CTMW-02S. The highest total iron concentration in groundwater of 25 mg/L was measured in a sample collected from CTMW-01S during PME #5. The highest dissolved iron concentration of 6.8 mg/L was measured in shallow groundwater at CTMW-02S during PME #5. Concentrations of ferrous iron in groundwater samples collected from the shallow monitoring wells generally exhibited a slight increase as performance monitoring progressed with the highest concentrations of >3.00 mg/L (PME #8) and 3.23 mg/L (PME #8) measured in groundwater samples collected from CTMW-01S and CTMW-02S. As further discussed in Section 5.1.5, decreases in hydraulic conductivity were observed in the vicinity of monitoring wells CTMW-01S and CTMW-02S; however, this may be due to other factors such as the reduction in saturated thickness between aguifer test events and/or bioaccumulation associated with the injection events. Additionally, other monitoring wells yielded groundwater samples where iron was observed to have increased, did not show evidence of reductions in hydraulic conductivity; therefore, it seems unlikely that precipitation of iron solids was occurring to a degree that may substantially impact hydraulic conductivity.

Of groundwater samples collected from the deep monitoring wells, dissolved iron was only detected during PME #4 in the sample collected from CTMW-06D at an estimated concentration above the laboratory reporting limit of 0.096 mg/L. Similar to groundwater in Qal, dissolved and total iron concentrations within groundwater of the UMCf at CTMW-01D, CTMW-02D, CTMW-03D, CTMW-04D, and CTMW-05D fluctuated throughout the performance monitoring events, but the magnitude of the fluctuations and concentrations in groundwater within the UMCf was one to two orders of magnitude less than in the shallow groundwater. Dissolved iron concentrations were not detected above the laboratory reporting limit in groundwater collected from CTMW-06D during any of the performance monitoring events, indicating that total iron concentrations in groundwater at CTMW-06D were potentially associated with aguifer solids. The highest dissolved iron concentration of 0.130 mg/L (estimated) was measured in groundwater collected from CTMW-05D during PME #6. The highest total iron concentration of 6.1 mg/L was measured in groundwater at CTMW-02D during PME #7. Concentrations of ferrous iron in groundwater within the UMCf fluctuated during performance monitoring with the highest concentration of 0.27 mg/L measured at CTMW-06D during PME #8. As further discussed in Section 5.1.5, decreases in hydraulic conductivity were observed in the vicinity of monitoring well CTMW-02D; however, this may be due to other factors such as bioaccumulation associated with the injection events. Additionally, other monitoring well locations where iron was observed to have increased, did not show evidence of reductions in hydraulic conductivity; therefore, it seems unlikely that precipitation of iron solids was occurring to a degree that may substantially impact hydraulic conductivity.

Manganese was analyzed to assess the potential for biologically-driven dissolution of manganese oxide coatings on aquifer solids (similar to iron oxides). The baseline groundwater sampling event conducted in April 2017 indicated that dissolved manganese concentrations in groundwater within the Qal ranged from 0.0091 to 0.038 mg/L in the treatability study area. An increasing trend of dissolved and total manganese concentrations in groundwater was observed at CTMW-01S, CTMW-02S, CTMW-03S, CTMW-04S, and CTMW-06S during performance monitoring. The highest dissolved and total manganese concentrations in groundwater of 5.6 mg/L and 7.1 mg/L, respectively, were measured at CTMW-06S during PME #8. As further discussed in Section 5.1.5, decreases in hydraulic conductivity were observed in the vicinity of monitoring wells CTMW-01S and CTMW-02S; however, this may be due to other factors such as the reduction in saturated thickness between aquifer test events and/or bioaccumulation associated with the injection events. Additionally, other monitoring wells where manganese was observed to have increased, did not show evidence of reductions in hydraulic conductivity; therefore, it seems unlikely that dissolution of manganese oxide coatings on aquifer solids was occurring to a degree that may substantially impact hydraulic conductivity.

The baseline groundwater sampling event conducted in April 2017 indicated that dissolved manganese concentrations in groundwater within the UMCf ranged from non-detect to 0.058 mg/L in the treatability study area. An increasing trend of dissolved and total manganese concentrations was observed in groundwater at CTMW-01D, CTMW-02D, CTMW-05D, and CTMW-06D during performance monitoring. A decreasing trend of dissolved and total manganese concentrations was observed in groundwater at CTMW-03D and CTMW-04D. The highest dissolved manganese concentration of 0.400 mg/L was measured in groundwater at CTMW-02D during PME #6 and the highest total manganese concentration of 0.49 mg/L was measured in groundwater at CTMW-02D during PME #7. As further discussed in Section 5.1.5, decreases in hydraulic conductivity were observed in the vicinity of monitoring well CTMW-02D; however, this may be due to other factors such as bioaccumulation associated with the injection events. Additionally, other monitoring wells where manganese concentration in groundwater was observed to have increased, did not show evidence of reductions in hydraulic conductivity; therefore, it seems unlikely that precipitation of manganese solids was occurring to a degree that may substantially impact hydraulic conductivity.

The increases in metal concentrations such as arsenic, iron and manganese, is spatially limited to groundwater at the treatability study wells and concentrations are expected to return to baseline concentrations downgradient and within the treatment zone as the geochemical conditions return to baseline conditions (Borden, et al., 2015).

5.1.2.9 Additional Analytes

Several other parameters were periodically analyzed during the treatability study. A summary of these parameters and their significance are presented below. Results of each parameter analyzed are presented in the comprehensive data tables provided in Appendix G.

- TDS was analyzed to assess the impact of salts on delayed or slower hexavalent chromium biodegradation. TDS values ranged from 7,300 to 20,000 mg/L and 9,600 to 15,000 mg/L in groundwater within the Qal and UMCf, respectively. The field biological reduction treatability study (similar to the bench-scale treatability study) indicated that TDS concentrations at these levels did not hinder microbial activity and hexavalent chromium biodegradation.
- Baseline alkalinity values in groundwater from both the Qal and UMCf were less than 200 mg/L. During the treatability study, groundwater within the Qal exhibited a considerable increase with observed alkalinity concentrations as high as 6,300 mg/L (CTMW-01S). Groundwater within the UMCf exhibited an increase in alkalinity concentrations, with concentrations as high as 920 mg/L (CTMW-01D) at five of the six deep monitoring wells. Alkalinity increases occur due to microbial respiration and production of carbon dioxide, which in solution could combine with native calcium to form calcium carbonate. These increases in groundwater alkalinity compared to baseline concentrations indicate an increased level of microbial activity and serve as an indirect indicator of groundwater undergoing biodegradation.
- An increase in chloride concentrations in groundwater within the Qal at 5 of the 6 shallow wells and within the UMCf at 3 of the 6 deep wells was observed as the treatability study progressed compared to baseline concentrations. The most significant increase in chloride concentrations in groundwater was detected in the Qal at CTMW-04S, where chloride concentrations increased from 780 to 2,300 mg/L. In the UMCf, the most significant increase was at CTMW-06D, where chloride concentrations in groundwater increased from 1,300 to 1,700 mg/L. The reduction of perchlorate should result in an increase in chloride, but chloride may not be a useful indirect indicator of biodegradation because of its high native concentrations at the Site.
- Following carbon substrate injections, methane was periodically detected in groundwater samples collected from both the shallow and deep wells with a general increase in dissolved methane concentrations observed as the treatability study progressed. Most groundwater samples from the Qal and UMCf had methane concentrations well below 1 mg/L. The highest dissolved methane concentration in the Qal of 2.3 mg/L was measured in groundwater collected from CTMW-02S during PME #8, and the highest dissolved methane concentration in the UMCf of 0.29 mg/L was measured in groundwater collected from CTMW-01D during PME #7. Methanogenic conditions (signified by biological methane production) require highly reducing conditions that are generally not mandated for hexavalent chromium biodegradation. Based on dissolved methane concentration data, methanogenesis within the treatability study area was limited. The highest concentrations of dissolved methane in the Qal and UMCf occurred in groundwater that also displayed a favorable response to TOC and hexavalent chromium biodegradation.
- During the treatability study, the total nitrogen concentration increased in groundwater at CTMW-01S, CTMW-02S, and CTMW-06S, which may be related to nutrients introduced in the aquifer as part of the carbon substrate injections.
- Groundwater analytical results from the downgradient shallow monitoring wells show the generation of acetone and methyl ethyl ketone, also known as 2-butanone. High concentrations of carbon substrates in a highly reducing environment can lead to the generation of organic acids and intermediate fermentation-based products such as acetone and methyl ethyl ketone (Fowler et al, 2011). These products act as electron donors in the further degradation of electron acceptors under both aerobic and anaerobic conditions (Fowler et al, 2011). Concentrations of methyl ethyl ketone in groundwater at the closest monitoring wells, CTMW-01S and CTMW-02S, increased from non-detect concentrations to 11,000 μg/L

and 2,000 μ g/L, respectively. Acetone concentrations in groundwater at the closest monitoring wells, CTMW-01S and CTMW-02S, increased from non-detect concentrations to 2,800 μ g/L and 560 μ g/L (estimated by lab), respectively. At the farthest downgradient monitoring well, CTMW-06S, methyl ethyl ketone concentrations in groundwater increased to 4,000 μ g/L (estimated by lab) and acetone concentrations decreased from 1,700 μ g/L to 620 μ g/L (estimated by lab). As demonstrated by the decrease in acetone in groundwater at CTMW-06S, the concentrations of methyl ethyl ketone and other intermediate fermentation-based products are anticipated to similarly decrease in the treatment zone over time. Supplemental groundwater monitoring is recommended to confirm concentration decreases of acetone and methyl ethyl ketone as the geochemical conditions return to baseline conditions.

• VFAs were analyzed during the baseline and performance monitoring groundwater sampling events throughout the treatability study. These acids are produced continually during hydrolysis of the long-chain fatty acids of EOS_{PRO}® and are considered to be more readily available organic compounds for biodegradation. Acetic acid, n-butyric acid, and propionic acid were all detected in Qal and UMCf groundwater samples at concentrations greater than baseline concentrations during the treatability study. The highest concentrations of VFAs in groundwater within the Qal and UMCf generally correlated to wells where substrate propagation was observed based on TOC concentrations. At CTMW-01S, acetic acid, n-butyric acid, and propionic acid concentrations increased in groundwater from non-detectable to 4,400 mg/L, 4,100 mg/L, and 2,000 mg/L, respectively. At CTMW-01D, acetic acid, n-butyric acid, and propionic acid concentrations increased in groundwater from non-detectable to 160 mg/L, 350 mg/L, and 33 mg/L (estimated), respectively.

5.1.3 Field Parameters

5.1.3.1 Dissolved Oxygen

As previously discussed in Section 2.1, hexavalent chromium reduction does not proceed under aerobic conditions. Therefore, DO measurements are a useful parameter to ascertain geochemical conditions in the groundwater and to confirm that anaerobic conditions have been achieved and sustained, which is essential for hexavalent chromium biodegradation. As a result, DO measurements for the shallow and deep wells were made during the baseline and all performance monitoring events.

Shallow Wells

DO readings for the shallow monitoring wells are summarized in *Table 18*.

Table 18 Summary of Dissolved Oxygen Readings in Shallow Wells – Biological Reduction Study

Event	Weeks	Dissolved Oxygen Concentration (mg/L)							
	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S		
Baseline	0	1.71	1.56	1.88	1.39	NS	NS		
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	1.87	7.53*	1.40	1.43	NS	NS		
PME #2	4	1.21	1.68	4.75	1.16	NS	NS		
PME #3	6	1.05	1.82*	1.14	1.45	NS	NS		
	Carb	on Substra	te Injection	Event #2 (6/	6/17 – 6/9/17	')			
PME #4	9	0.56	0.56	0.26	0.36	1.09	0.66		
PME #5	13	0.77	0.77*	0.87	1.40	0.82	0.61		

	Weeks	Dissolved Oxygen Concentration (mg/L)								
Event	Following 1 st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S			
Carbon Substrate Injection Event #3 (8/7/17 – 8/11/17)										
PME #6	18	2.06*	Dry	1.53	1.49	0.87	6.50*			
PME #7	22	0.15	NA	0.16	0.16	0.17	0.18			
PME #8	24	1.09*	0.26*	0.84	0.18	0.66	0.17			

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

Dry - not sampled; well was observed to be dry

PME - Performance Monitoring Event

NA - Insufficient volume collected for water quality meter reading

The baseline groundwater sampling event in April 2017 indicated an aerobic aquifer with DO concentrations in the Qal between 1.39 and 1.88 mg/L throughout the biological reduction study area. Based on DO readings collected during PME #1 through PME #3, DO concentrations generally were reflective of aerobic conditions, although slight decreases were observed in groundwater at CTMW-01S and CTMW-03S. During PME #4 through PME #5, DO concentrations significantly decreased when compared to baseline concentrations in groundwater at all wells except CTMW-04S. These decreases in DO concentrations generally correlated with the geochemical responses of hexavalent chromium, perchlorate, chlorate, and nitrate and were inversely related to TOC concentrations observed in these wells during the same timeframe. DO concentrations during PME #6 through PME #8 decreased in groundwater at all six monitored wells when compared to baseline concentrations. In addition, strongly anaerobic conditions (DO concentrations less than 0.5 mg/L) were observed in groundwater at all wells during PME #7 and three of the six monitoring wells during PME #8.

Deep Wells

DO readings for the deep monitoring wells are summarized in Table 19.

Table 19 Summary of Dissolved Oxygen Readings in Deep Wells - Biological Reduction Study

	Weeks									
Event	Following 1st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D			
Baseline	0	1.55	1.18	3.39	1.10	NS	NS			
	Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)									
PME #1	2	1.43	1.21	2.10	3.70	NS	NS			
PME #2	4	1.14	3.43	4.31	0.89	NS	NS			
PME #3	6	0.83	0.52	0.58	0.34	NS	NS			
	Carb	on Substra	te Injection	Event #2 (6/	/6/17 – 6/9/17)				
PME #4	9	0.49	0.41	1.15	0.50	1.59	0.15			
PME #5	13	0.36	0.68	0.78	0.71	0.80	0.63			
	Carbo	on Substrat	e Injection I	Event #3 (8/1	7/17 – 8/11/1	7)				
PME #6	18	0.73	0.75	0.74	0.78	0.72	0.90			
PME #7	22	0.21	0.12	0.12	0.16	0.22	0.49			

^{* –} Denotes well was not purged via low flow method due to insufficient water/recharge; water quality readings, therefore, may be less representative of groundwater conditions than readings obtained via low flow through a flow cell.

Event	Weeks	Dissolved Oxygen Concentration (mg/L)						
	Following 1st Injection	CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D	
PME #8	24	0.28	0.13	1.57	0.16	2.45	0.55	

mg/L - milligrams per liter

NS - not sampled; well was not yet installed

PME - Performance Monitoring Event

The baseline groundwater sampling event in April 2017 indicated an aerobic aquifer with DO concentrations in the UMCf between 1.10 and 3.39 mg/L throughout the treatability study area. Based on DO readings collected during PME #1 through PME #3, DO concentrations substantially decreased in groundwater at all monitoring wells when compared to baseline. During PME #4 and PME #5, DO concentrations in groundwater continued to decrease or remain low at all deep wells. DO concentrations during the final sampling events (PME #6 through PME #8) remained low in groundwater at the majority of wells during each event, with data indicating strongly reducing conditions. DO concentration reductions in groundwater at CTMW-01D and CTMW-06D correlate with TOC increases, which may be indicative of increased chemical or biological oxygen demand in groundwater at these wells. DO concentrations in groundwater at CTMW-03D and CTMW-05D decreased during PME #6 and PME #7 but increased sharply during PME #8.

5.1.3.2 Oxidation-Reduction Potential

ORP readings sometimes provide a valuable tool to identify the redox conditions in groundwater and ascertain reducing conditions. At some sites, ORP readings correlate well with DO values and, therefore, provide a means to verify the extent of reduction. It should be noted that in aquifers with several electron acceptors and electron pairs, such as iron pairs, nitrogen pairs, perchlorate/chlorate/chloride, and sulfur pairs, it is possible that interference may occur with respect to redox measurements.

Shallow Wells

ORP readings for the shallow monitoring wells are summarized in *Table 20*.

Table 20 Summary of Oxidation-Reduction Potential Readings in Shallow Wells – Biological Reduction Study

	Weeks Following 1 st Injection	Oxidation-Reduction Potential (mV)						
Event		CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S	
Baseline	0	170	161	161	139	NS	NS	
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)								
PME #1	2	-166	190*	-3	120	NS	NS	
PME #2	4	-298	-43	145	-12	NS	NS	
PME #3	6	-157	150*	172	192	NS	NS	
Carbon Substrate Injection Event #2 (6/6/17 – 6/9/17)								
PME #4	9	-127	-145	33	-70	113	-125	
PME #5	13	-40	-31*	124	-1	115	-120	
Carbon Substrate Injection Event #3 (8/7/17 – 8/11/17)								
PME #6	18	-71*	Dry	14	-239	151	-92*	
PME #7	22	-72	NA	67	-119	163	-109	

Event	Weeks	Oxidation-Reduction Potential (mV)						
	Following 1st Injection	CTMW-01S	CTMW-02S	CTMW-03S	CTMW-04S	CTMW-05S	CTMW-06S	
PME #8	24	-82*	-107*	120	-242	147	-101	

mV - millivolts

NS – not sampled; well was not yet installed Dry – not sampled; well was observed to be dry

PME - Performance Monitoring Event

NA - Insufficient volume collected for water quality meter reading

* – Denotes well was not purged via low flow method due to insufficient water/recharge; DO reading, therefore, may be less representative of well conditions than readings obtained via low flow through a flow cell.

The baseline groundwater sampling event in April 2017 indicated that each of the four shallow monitoring wells sampled had positive ORP readings, indicating aerobic conditions. As with the DO measurements, decreases in ORP measurements were observed throughout the study in groundwater at monitoring wells CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S. These measurements were as low as -242 mV during the final event, indicating strongly reducing conditions. Although some decreases/fluctuations of ORP measurements were observed during the study in groundwater at monitoring wells CTMW-03S and CTMW-05S (generally crossgradient), ORP measurements indicate generally aerobic conditions and retained positive values during this time period.

Deep Wells

ORP readings for the deep monitoring wells are summarized in Table 21.

Table 21 Summary of Oxidation-Reduction Potential Readings in Deep Wells - Biological Reduction Study

	Weeks Following 1 st Injection	Oxidation-Reduction Potential (mV)						
Event		CTMW-01D	CTMW-02D	CTMW-03D	CTMW-04D	CTMW-05D	CTMW-06D	
Baseline	0	100	120	214	143	NS	NS	
Carbon Substrate Injection Event #1 (4/18/17 – 4/21/17)								
PME #1	2	79	125	183	201	NS	NS	
PME #2	4	-23	33	167	185	NS	NS	
PME #3	6	-14	164	213	181	NS	NS	
	Carl	on Substra	te Injection	Event #2 (6/	6/17 – 6/9/17	')		
PME #4	9	-130	-161	-193	-66	142	85	
PME #5	13	-120	39	110	-36	140	87	
Carbon Substrate Injection Event #3 (8/7/17 – 8/11/17)								
PME #6	18	-162	-163	-28	-69	88	11	
PME #7	22	-103	53	71	-96	111	170	
PME #8	24	-19	-14	77	-131	142	180	

Notes:

mV-millivolts

NS - not sampled; well was not yet installed

PME – Performance Monitoring Event

The baseline groundwater sampling event in April 2017 indicated that groundwater at each of the four deep monitoring wells sampled had positive ORP readings, indicating aerobic conditions.

As with the DO measurements, decreases in ORP measurements were observed throughout the study in groundwater within the UMCf at monitoring wells CTMW-01D, CTMW-02D, CTMW-03D, and CTMW-04D. In general, lower ORP measurements were observed during the performance monitoring event following carbon substrate events #2 and #3, with measurements as low as -193 mV in groundwater at CTMW-03D during PME #4. During the final event, the ORP measurements were as low as -131 mV, indicating reducing conditions were present. ORP measurements fluctuated throughout the study, but groundwater at CTMW-01D and CTMW-04D, showed sustained reducing conditions following the second injection event.

5.1.3.3 pH

Groundwater pH and temperature are common environmental factors that could affect microbial activity, with microorganisms generally preferring a pH between 6 and 8 standard units and warmer temperatures. Biological reduction due to carbon substrate injection often leads to acid production, which then results in lowering of pH and causes potential stress on native microorganisms. Groundwater pH and temperature within the biological reduction study area groundwater in both the Qal and UMCf generally remained within ideal ranges, with pH ranging from 5.05 to 8.71 standard units and temperatures greater than 20 degrees Celsius. Lower pH values were observed in groundwater within the nearest downgradient shallow monitoring wells following the first injection event. For subsequent injection events, sodium bicarbonate was added to the injection solution to help buffer the solution and avoid large fluctuations in pH associated with the low pH industrial sugar wastewater solution and geochemical responses to the microbial activity. The pH values ranged from 5.94 to 7.98 in the downgradient wells following the addition of sodium bicarbonate to the injection solution.

5.1.4 Microbial Results

Bio-Trap® samplers were deployed in select wells to obtain specialized microbial data to gauge the response of the microbial community to the addition of carbon substrate into groundwater and to evaluate biodegradation potential. Bio-Trap® samplers are patented devices available through a specialized microbial firm, Microbial Insights, Inc. in Knoxville, Tennessee. Structurally, they are cylindrical containers with a diameter size small enough to be deployed into a conventional monitoring well for a stipulated period of time (generally 30 to 60 days). The samplers contain a unique sampling matrix, Bio-Sep® beads, which are 2-4 mm in diameter and are an engineered composite of Nomex® and powdered activated carbon. When a Bio-Trap® sampler is deployed in a monitoring well, the Bio-Sep® beads absorb contaminants and nutrients present in the aquifer essentially becoming an in-situ microcosm with a very large surface area (~600 square meter per gram) which is readily colonized by subsurface microorganisms. Once recovered from a monitoring well after deployment, DNA, ribonucleic acid (RNA), or PLFA can be extracted from the beads for CENSUS® or PLFA assays to evaluate the microbial community. In many ways, Bio-Trap® samplers provide an integrated vision of the microbial community rather than a onetime "snapshot" sampling event. Microorganisms colonize the beads and therefore the microbial communities are more likely to represent the active members of the subsurface microbial community.

Four Bio-Trap® samplers were deployed in wells CTIW-01S, CTIW-01D, CTMW-03S, and CTMW-03D within the study area on March 10, 2017 to establish baseline conditions. These wells were selected because they were the first wells installed in the study area and the only wells installed at the time of deployment. The samplers were retrieved and shipped to Microbial Insights for analyses on April 5, 2017. The results for the microbial analysis associated with the baseline groundwater monitoring are provided in *Table 22* and the laboratory reports are included in Appendix J.

Table 22 Bio-Trap® Results Collected During Baseline Groundwater Monitoring – Biological Reduction Study

Downwater	Baseline						
Parameter	CTIW-01S	CTIW-01D	CTMW-03S	CTMW-03D			
Sulfate Reducing Bacteria (cells/bead)	<2.50 x 10 ²	1.11 x 10 ⁴	<2.50 x 10 ²	1.82 x 10 ³			
Perchlorate Reductase (cells/bead)	6.09 x 10 ⁴	2.80 x 10 ⁵	2.39 x 10 ⁴	4.05 x 10 ⁵			
Total Biomass (cells/mL)	3.92 x 10 ⁴	1.43 x 10 ⁵	7.40 x 10 ⁴	1.19 x 10 ⁵			
Community Structure (% total PLFA)							
Firmicutes (TerBrSats)	0.00	0.51	0.00	1.26			
Proteobacteria (Monos)	76.73	77.33	82.94	72.35			
Anaerobic metal reducers (BrMonos)	2.86	6.55	2.03	2.95			
SRB/Actinomycetes (MidBrSats)	2.17	0.60	0.00	4.18			
General (Nsats)	18.23	13.59	15.02	18.63			
Eukaryotes (polyenoics)	0.00	1.40	0.00	0.65			
Physiological Status (Proteobacteria Only)							
Slowed growth	1.40	1.96	2.42	1.18			
Decreased Permeability	0.00	0.10	0.00	0.05			

Table 22 also summarizes the details of the microbial community structure that was determined from PLFA analyses. The large proportion of Proteobacteria (greater than 70% in all wells) indicates a proliferation of the appropriate bacterial community which is gram negative (generally indicative of reducing conditions), has the ability to utilize a variety of carbon sources, has adapted easily to the groundwater environment, and is representative of both aerobic and anaerobic bacteria. On the other hand, the low proportions (less than 10%) of metal reducing bacteria and sulfate reducing bacteria (SRB)/actinomycetes reveal redox conditions that are not overly reducing, thereby limiting and controlling sulfate-reduction. Eukaryotes percentages are also relatively low in all the wells indicating that these scavengers of valuable contaminant-reducing bacteria do not pose a significant threat in this groundwater.

Ratios for slowed growth and for decreased permeability of the cell membrane provide information on the "health" of the gram negative microbial community and how this population is responding to the conditions present in the environment. Higher numbers (i.e., greater than 0.5) are generally reflective of a community that is stressed and has become more toxic and not as supportive of the microbial community, often due to a lack of available carbon substrate. Lower ratios (less than 0.5) generally indicate availability of substrate and the creation of an environment that is supportive of a diverse microbial community. Results of the physiological status indicate that the ratios for slowed growth are on the higher side, indicating an environment that is stressed and under natural conditions could be unfavorable to gram negative Proteobacteria, which are important for biodegradation (particularly anaerobic biodegradation), either due to lack of carbon substrate or due to toxic conditions. However, the ratios of decreased permeability are on the lower side, which indicate that toxicity may not be an inherent issue.

Mid-way through the treatability study, four new Bio-Trap® samplers were deployed in wells CTMW-01S, CTMW-01D, CTMW-03S, and CTMW-03D within the study area on June 22, 2017. CTMW-03S and CTMW-03D were selected since they had previously been selected for microbial analysis as part of the baseline groundwater monitoring. The injection wells CTIW-01S and CTIW-01D were previously selected for microbial analysis as part of the baseline groundwater monitoring, but were not selected for subsequent microbial analysis since carbon substrate injections had recently occurred and the potential for the injection wells to contain higher concentrations

of residual injectate may have influenced results. Subsequently, the nearby monitoring wells CTMW-01S and CTMW-01D were selected instead. The samplers were in-place for over 30 days and were retrieved and shipped to Microbial Insights for analyses on July 17, 2017. The results for the microbial analysis associated with PME #5 groundwater monitoring are provided in *Table 23*.

Table 23 Bio-Trap® Results Collected During PME #5 Groundwater Monitoring – Biological Reduction Study

Barrantan	PME #5						
Parameter	CTMW-01S	CTMW-01D	CTMW-03S	CTMW-03D			
Sulfate Reducing Bacteria (cells/bead)	1.43 x 10 ³	<2.50 x 10 ²	<2.50 x 10 ²	1.30 x 10 ⁴			
Perchlorate Reductase (cells/bead)	9.09 x 10 ³	3.51 x 10 ⁴	3.51 x 10 ⁴	1.35 x 10 ⁴			
Total Biomass (cells/mL)	8.22 x 10 ⁵	2.70 x 10 ⁵	2.47 x 10 ⁶	5.68 x 10 ⁵			
Community Structure (% total PLFA)							
Firmicutes (TerBrSats)	12.09	6.06	2.24	0.00			
Proteobacteria (Monos)	49.47	70.94	74.21	74.65			
Anaerobic metal reducers (BrMonos)	1.75	3.72	0.46	2.10			
SRB/Actinomycetes (MidBrSats)	0.62	0.00	0.37	3.30			
General (Nsats)	32.50	17.84	21.31	17.55			
Eukaryotes (polyenoics)	3.55	1.43	1.42	2.39			
Physiological Status (Proteobacteria Only)							
Slowed growth	1.14	0.81	1.43	1.18			
Decreased Permeability	0.64	0.24	0.31	0.49			

Microbial biomass (cells per bead) in groundwater at the four wells that were sampled ranged from 2.70×10^5 in well CTMW-01D to 2.47×10^6 in well CTMW-03S. These numbers increased from the prior microbial sampling and are indicative of a robust microbial population in groundwater that could possess the ability to biodegrade the COPCs.

Table 23 also summarizes the details of the microbial community structure that was determined from PLFA analyses. The large proportion of Proteobacteria (greater than 49% at CTMW-01S and greater than 70% at all other wells) indicates a proliferation of the appropriate bacterial community which is gram negative, has the ability to utilize a variety of carbon sources, has adapted easily to the groundwater environment, and is representative of both aerobic and anaerobic bacteria. Generally, these proportions are similar to the previous microbial sampling. The Proteobacteria population at CTMW-01S is considerably lower than at the other wells, but still a large overall proportion. The low proportions (less than 10%) of metal reducing bacteria and sulfate reducing bacteria (SRB)/actinomycetes reveal redox conditions that are not overly reducing, thereby limiting and controlling sulfate-reduction. Additionally, these proportions have decreased compared to the previous microbial sampling. Eukaryotes percentages slightly increased from the previous microbial sampling, but are still relatively low at all the wells, indicating that these scavengers of valuable contaminant-reducing bacteria do not pose a significant threat in this groundwater.

Ratios for slowed growth decreased during the study at all wells indicating that the overall toxicity could have decreased in addition to increased carbon substrate availability. This is indicative of an overall environment favorable to gram negative Proteobacteria, which are important for biodegradation. The ratios for decreased permeability increased slightly, but still remained at levels that are supportive of Proteobacterial growth.

60

5.1.5 Hydrogeological Evaluation

5.1.5.1 Horizontal and Vertical Groundwater Gradients

Downgradient groundwater monitoring wells within the biological reduction study area were gauged during the baseline monitoring event, during the injection events, and during each performance monitoring event to evaluate changes in both horizontal and vertical groundwater gradients during the treatability study. The groundwater gauging data is provided in Appendix E. Overall, the horizontal groundwater gradient in both the Qal and UMCf ranged from approximately 0.019 to 0.021 ft/ft to the northeast within the biological reduction study area throughout the duration of the treatability study. There was an average downward vertical gradient of 0.018 ft/ft, as evaluated with each well cluster, during the treatability study.

As would be expected, temporary groundwater mounding was observed during injection events within the Qal and the UMCf. For example, during the third injection event, which was performed following the installation of downgradient monitoring wells CTMW-05S/D and CTMW-06S/D, groundwater mounding within the Qal ranged from 2.73 feet at CTMW-02S (located approximately 12 ft from the nearest shallow injection well) to 0.50 ft at CTMW-03S (located approximately 32 ft from the nearest shallow injection well). Groundwater mounding within the UMCf during the third injection event ranged from 7.53 ft at CTMW-01D (located approximately 12 ft from the nearest deep injection well) to 0.87 ft at CTMW-05D (located approximately 45 ft from the nearest deep injection well). As expected, the horizontal and vertical gradients in the immediate vicinity of the injection wells were affected during injections. However, the primary flow direction is horizontal and the groundwater levels returned to baseline conditions within one day following injections. Due to the observed short temporal duration of the mounding, it is highly unlikely that the overall perchlorate plume migration was significantly modified as a result of the injections.

5.1.5.2 Aquifer Testing

As part of the hydrogeological evaluation, aquifer testing was periodically performed in select wells during the treatability study. The objective of the aquifer testing was to estimate aquifer hydraulic conductivity (K) in the study area before and after injection of the substrate. Because the injection of substrate has the potential to decrease hydraulic conductivity, particularly in the vicinity of injection wells, K estimates in the same wells before and after injection were compared. Aquifer testing consisted of specific capacity testing in the shallow wells (due to insufficient water to permit slug testing) and slug testing and specific capacity testing in the deep wells.

As explained in Section 4.1.4, the first round of slug testing was performed in December 2016 (pre-injection test) on wells CTIW-01D and CTMW-03D. Additional pre-injection slug testing was also conducted in April 2017 on the injection and monitoring wells that were installed following the initial slug testing event. Finally, post-injection slug testing was conducted on the all the deep wells in October and November 2017. The slug testing was conducted following the methods described in Section 4.1.4.

Slug testing of the shallow wells was not possible as there was insufficient water in the shallow wells to permit slug testing. As such, specific capacity tests were conducted in shallow and deep wells to estimate location-specific hydraulic conductivity in the Qal, as well as provide a comparison of specific capacity hydraulic conductivity values with the corresponding slug test hydraulic conductivity estimates for the same wells. Preinjection specific capacity testing was conducted in February 2017 and April 2017 on select wells. Post-injection specific capacity tests were conducted on select wells in October 2017. The methods used to conduct the specific capacity tests are described in Section 4.1.4.

Following the completion of the slug tests and specific capacity tests, the test data were downloaded from the transducer or entered from field data sheets, and analyzed using commercially-available AQTESOLV software (HydroSOLVE, Inc., 2007). The Bouwer and Rice method for analyzing slug tests in an unconfined aquifer was used to estimate hydraulic conductivity (Bouwer & Rice, 1976), while the specific capacity test data were analyzed using the Theis method (Theis, 1935) or the Hantush-Jacob leaky aquifer solution (Hantush, 1955). Results

obtained from the slug and specific capacity testing, which includes the AQTESOLV interpretation plots, are provided in Appendix C. If recovery times at each well allowed (i.e. wells with higher K values), multiple tests were conducted and the corresponding hydraulic conductivity estimates were averaged. *Table 24* and *Table 25* summarize the mean hydraulic conductivities for the shallow and deep wells based on the specific capacity test and slug test results, respectively.

Table 24 Shallow and Deep Specific Capacity Test Results - Biological Reduction Study

	Mean Hydraulic Conductivity (feet/day)				
Well	Pre-Injection Pre-Injection (February 2017) (April 2017)		Post-Treatability Study (October/November 2017)		
CTIW-01S	61				
CTIW-01D	1.5	1.0			
CTIW-02S		30			
CTIW-02D		0.6			
CTIW-03S		53			
CTIW-03D		0.2			
CTMW-01S	15		0.41		
CTMW-01D		0.5			
CTMW-02S		27	0.51		
CTMW-02D		0.4			
CTMW-03S	75		128		
CTMW-03D	3.0				
CTMW-04S		34	22.8		
CTMW-04D		0.4			
CTMW-05S			36		
CTMW-06S			105.1		

Table 25 Deep Slug Test Results – Biological Reduction Study

	Mean Hydraulic Conductivity (feet/day)				
Well	Pre-Injection Pre-Injection (December 2016) (April 2017)		Post-Treatability Study (October/November 2017)		
CTIW-01D	1.4		0.9		
CTIW-02D		1.0	0.1		
CTIW-03D		0.3	0.4		
CTMW-01D		0.5	0.7		
CTMW-02D		0.6	0.5		
CTMW-03D	2.5		3.1		
CTMW-04D		1.1	1.3		

62

	Mean Hydraulic Conductivity (feet/day)				
Well	Pre-Injection (December 2016)	Pre-Injection (April 2017)	Post-Treatability Study (October/November 2017)		
CTMW-05D			1.5		
CTMW-06D			1.0		

Based on the baseline (pre-injection) slug test results, the estimated Ks for are generally consistent with the lithologies observed within the screened interval of the deep wells, which was primarily silt to sandy silt. Prior estimates of the hydraulic conductivity for the UMCf have ranged from less than 0.01 ft/d to more than 10 ft/d. The baseline estimates from the biological reduction study area slug tests ranged from about 0.1 to 3.1 ft/d, which is within the previous estimated range for the deep wells. Results of the specific capacity tests revealed that the specific capacity K estimates in the deep wells are similar to the corresponding slug test K estimates from the same wells. However, the specific capacity test results from the shallow wells are likely to be heavily influenced by saturated thickness, since less than 2 feet of saturated thickness exists in the shallow wells.

Several wells were tested (slug and specific capacity) following the completion of the injection activities to assess whether the injections had potentially influenced K. The K estimates from the pre-injection (December 2016, February 2017, and April 2017) and post-injection (October/November 2017) tests are provided in Appendix C. The hydraulic conductivity was not affected in most of the deep wells; however, the hydraulic conductivity at CTIW-02D decreased from 1.0 to 0.1 ft/d, a change which may be related to bioaccumulation associated with the injection events. Shallow monitoring wells CTMW-01S and CTMW-02S also had significant decreases in hydraulic conductivity from 15 to 0.41 ft/d and from 27 to 0.51 ft/d, respectively. However, the decreases in hydraulic conductivity in these monitoring wells are largely attributed to the reduction in saturated thickness between aquifer test events but may also be related to bioaccumulation associated with the injection events (Appendix C).

5.2 CHEMICAL REDUCTION STUDY

This section presents a summary of the groundwater data collected for the chemical reduction study, which was conducted within the footprint of the AP Area Up and Down Flushing Treatability Study. For the chemical reduction study, the most significant groundwater parameters related to chemical reduction of hexavalent chromium discussed herein are hexavalent chromium, pH, DO, and ORP. Summary tables of additional analytical results are provided in Appendix G. It should be noted that this report focuses on groundwater monitoring conducted prior to and subsequent to chemical injections, which is a subset of the overall data collected as part of the AP Area Up and Down Flushing Treatability Study. As a result, the AP Area Up and Down Flushing Treatability Study report will provide the remaining data collected as part of the AP Area Up and Down Flushing Treatability Study, as well as soil analytical data collected during well installation. A hydrogeological evaluation based on the results of groundwater gauging and aquifer testing is provided in Section 5.2.2.

5.2.1 Groundwater Results

The following subsections present the groundwater results for hexavalent chromium and field parameters, consisting of pH, DO and ORP.

5.2.1.1 Hexavalent Chromium

Hexavalent chromium was analyzed to monitor changes in concentration following injections in the Qal and UMCf to ascertain the effectiveness of chemical reduction. Groundwater results from groundwater monitoring events for shallow, intermediate, and deep monitoring wells are summarized in *Table 26* through *Table 28*, respectively.

Table 26 Hexavalent Chromium Groundwater Results in Shallow Wells - Chemical Reduction Study

	Hexavalent Chromium Concentration (mg/L)					
Event	Plot 1			Plot 2		
	UFMW-01S	UFMW-02S	UFMW-03S	UFMW-04S	UFMW-05S	UFMW-06S
Baseline (August 2016)	0.000025U	0.000025 U	Dry	0.0066	0.000025 U	0.028
Chemical Injection Event (8/7/17 – 8/8/17)						
August 2017	0.00075 J	Dry	Dry	0.011	0.006	0.0045
October 2017	Dry	Dry	Dry	0.002	0.0011 J	0.013 U

Notes:

mg/L - milligrams per liter

Dry - not sampled; well was observed to be dry

U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit indicated.

J – The result is an estimated quantity

As presented in *Table 26*, several of the shallow monitoring wells did not contain much groundwater, with most of the wells in Plot 1 going dry during the performance monitoring events. Water samples from these wells were collected either by using a disposable bailer or peristaltic pump when low flow conditions could not be achieved. The baseline groundwater sampling event indicated that groundwater at three of the five shallow monitoring wells did not have a concentration of hexavalent chromium above the laboratory reporting limit, and hexavalent chromium concentrations in groundwater at wells UFMW-04S and UFMW-06S were 0.0066 and 0.028 mg/L, respectively. Slight fluctuations in the hexavalent chromium concentrations were observed in the shallow wells sampled during the August and October 2017 sampling events, but decreases in hexavalent chromium reduction were limited by the low baseline concentrations in the shallow wells.

Table 27 Hexavalent Chromium Groundwater Results in Intermediate Wells - Chemical Reduction Study

	Hexavalent Chromium Concentration (mg/L)					
Event	Plot 1			Plot 2		
	UFMW-01I	UFMW-02I	UFMW-03I	UFMW-04I	UFMW-05I	UFMW-06I
Baseline (August 2016)	0.019	0.018	0.018	0.026	0.011	0.027
Chemical Injection Event (8/7/17 – 8/8/17)						
August 2017	0.000078 J	0.0052	0.0013 J	0.031	0.022	0.016 J-
October 2017	0.000080 J	0.0042	0.0024	0.0085	0.018	0.0082

Notes:

mg/L - milligrams per liter

J- - The result is an estimated quantity, but the result may be biased low.

Overall, hexavalent chromium concentrations decreased within the intermediate monitoring wells (*Table 27*). The baseline groundwater sampling event data indicated relatively low hexavalent chromium concentrations in the intermediate wells with concentrations ranging from 0.011 to 0.026 mg/L. Reductions in hexavalent chromium concentrations were detected at five of the six intermediate monitoring wells. At Plot 1, hexavalent chromium concentrations decreased in groundwater at monitoring wells UFMW-01I, UFMW-02I, and UFMW-03I by 99%, 77%, and 87%, respectively. At Plot 2, hexavalent chromium concentrations decreased in groundwater adjacent to monitoring wells UFMW-04I and UFMW-06I by 67% and 70%, respectively.

Hexavalent Chromium Concentration (mg/L) Plot 1 Plot 2 **Event** UFMW-01D **UFMW-02D** UFMW-03D **UFMW-04D UFMW-05D UFMW-06D Baseline** 0.015 0.012 0.029 0.027 0.0058 0.016 (August 2016) Chemical Injection Event (8/7/17 – 8/8/17) Conducted Only in Shallow and Intermediate Wells August 2017 0.016 0.013 0.011 0.036 0.022 0.026 J-October 2017 0.021 0.013 0.0083 0.029 0.018 0.027

Table 28 Hexavalent Chromium Groundwater Results in Deep Wells - Chemical Reduction Study

Notes:

mg/L - milligrams per liter

As mentioned in Section 4.2.5, no injections were performed in the deep injection wells so they could be used to monitor the potential vertical migration of contaminants from injections into the intermediate injection wells. In general, there was no change in hexavalent chromium concentrations in in groundwater at the deep monitoring wells, with the exception of UFMW-03D, where concentrations decreased from 0.029 mg/L to 0.0083 mg/L. The lack of overall reduction of hexavalent chromium concentrations in the deep wells indicates that there was no significant downward vertical migration of the CPS solution.

5.2.1.2 pH

Field measurements for pH were collected during groundwater sampling to assess changes in pH from baseline and post-injections as pH is an important groundwater quality parameter for assessing changes in geochemical conditions. Within the shallow wells, the baseline pH ranged from 7.15 to 8.14 standard units and decreased slightly during the August 2017 and October 2017 groundwater sampling events with the lowest pH of 5.58 standard units detected in groundwater at well UFMW-05S. The reason for the decrease in pH levels are unknown, but may be partially caused by the decrease in saturated thickness in the shallow wells and application of SLMW to the vadose zone from soil flushing activities occurring as part of the AP Area Up and Down Flushing Treatability Study. The pH levels in both intermediate and deep wells remained generally consistent throughout the study.

5.2.1.3 Dissolved Oxygen

Dissolved oxygen was analyzed to monitor changes in concentration from baseline values to post-injections to evaluate the reducing conditions in the shallow, intermediate, and deep zones. Data for DO can be found in Appendix G.

The baseline groundwater sampling event data indicated that DO concentrations in the shallow groundwater ranged from 0.85 mg/L to 1.91 mg/L. Well UFMW-03S was not sampled during the baseline or subsequent groundwater monitoring events because the well was dry. In groundwater at the shallow groundwater monitoring wells, DO concentrations decreased in groundwater at UFMW-01S, UFMW-04S, UFMW-05S, and UFMW-06S during the August 2017 groundwater sampling event, but DO concentrations rebounded in groundwater at UFMW-05S and UFMW-06S during the October 2017 groundwater sampling event.

In groundwater at the intermediate groundwater monitoring wells, the DO concentrations ranged from 0.32 mg/L to 2.12 mg/L during the baseline sampling event and decreased during the August 2017 groundwater sampling event with non-detect values in groundwater at UFMW-01I through UFMW-05I. However, DO concentrations rebounded during the October 2017 sampling event, with the highest DO concentration of 3.06 mg/L detected in groundwater at UFMW-03I.

J-- The result is an estimated quantity, but the result may be biased low.

Within the UMCf, DO concentrations ranged from 0.55 to 3.54 mg/L during the baseline sampling event and decreased by the August 2017 groundwater sampling event with non-detect values confirmed in samples collected from wells UFMW-02D through UFMW-05D. DO concentrations rebounded during the October 2017 sampling event in groundwater at UFMW-02D through UFMW-05D. However, DO concentrations decreased at in groundwater at UFMW-01D and UFMW-06D by the October 2017 sampling event.

In general, the DO concentrations were highly variable, likely due to the decrease in saturated thickness in the shallow wells and soil flushing activities occurring as part of the AP Area Up and Down Flushing Treatability Study.

5.2.1.4 Oxidation-Reduction Potential

Like DO, ORP was also analyzed to monitor changes from baseline values to post-injections to evaluate the reducing conditions in the shallow, intermediate, and deep zones. Data for ORP can be found in Appendix G.

The baseline groundwater sampling event data indicated that ORP in groundwater at the shallow wells ranged from 31 mV to 219 mV, which is indicative of aerobic conditions. ORP decreased in groundwater at UFMW-01S by the August 2017 groundwater sampling event, but ORP increased in groundwater at UFMW-04S through UFMW-06S by the August 2017 and October 2017 groundwater sampling events.

The baseline groundwater sampling event data indicated that ORP in the intermediate zone of the UMCf ranged from 119 mV to 180 mV, indicative of aerobic conditions. ORP decreased in groundwater at UFMW-01I through UFMW-05I by the August 2017 groundwater sampling event, correlating to decreases in DO concentrations during this time period. ORP values rebounded in groundwater at UFMW-01I through UFMW-05I by the October 2017 groundwater sampling event, but ORP decreased in groundwater at UFMW-06I during this time period.

The baseline groundwater sampling event data indicated that ORP in the deep zone of the UMCf ranged from 93 mV to 180 mV, indicative of aerobic conditions. ORP decreased in groundwater at UFMW-01D through UFMW-04D by the August 2017 groundwater sampling event, correlating to decreases in DO concentrations during this time period. ORP, however, increased slightly in groundwater at UFMW-05D by the August 2017 groundwater sampling event despite a decrease in DO, and ORP also increased slightly in groundwater at UFMW-06D by this time period. ORP values rebounded in groundwater at UFMW-01D through UFMW-04D by the October 2017 groundwater sampling event, but ORP values decreased in groundwater at UFMW-06D by this time period.

Overall, ORP values less than 0 mV were not measured in the shallow, intermediate or deep zones monitored, indicating that strongly anaerobic conditions were not established.

5.2.2 Hydrogeological Evaluation

5.2.2.1 Horizontal and Vertical Groundwater Gradients

Groundwater monitoring wells within the chemical reduction study area were gauged weekly during the chemical reduction study as part of the AP Area Up and Down Flushing Treatability Study. The horizontal and vertical groundwater gradients within the chemical reduction study area are significantly influenced by nearby soil flushing and groundwater extraction activities. In general, the horizontal groundwater gradient was to the north within the shallow, intermediate, and deep wells with an average gradient of 0.024 ft/ft, 0.033 ft/ft, and 0.023 ft/ft, respectively. Vertical groundwater gradients varied between well clusters and ranged from a downward gradient of 0.0064 ft/ft to an upward gradient of 0.0164 ft/ft from the shallow to intermediate wells and from a downward gradient of 0.0546 ft/ft to an upward gradient of 0.0073 ft/ft from the intermediate to deep wells. Potential temporary effects on horizontal or vertical gradients resulting from the CPS solution injections are undiscernible due to effects from the nearby soil flushing and groundwater extraction activities as part of the AP Area Up and Down Flushing Treatability Study.

5.2.2.2 Aquifer Testing

As part of the hydrogeological evaluation, aquifer slug testing was periodically performed in select wells during the treatability study. The objective of the slug testing was to estimate aquifer K in the study area before and after injection of the substrate. Because the injection of substrate has the potential to decrease hydraulic conductivity, particularly in the vicinity of injection wells, K estimates in the same wells before and after injection were compared.

As explained in Section 4.2.4, the first round of slug testing was performed in August/September 2016 and April 2017 on select wells. Finally, post-injection slug testing was conducted on select intermediate injection wells and intermediate and deep monitoring wells in October and November 2017. The slug testing was conducted following the methods described in Section 4.2.4.

Slug testing of the shallow wells was not possible as there was insufficient water in the shallow wells to permit slug testing. As such, specific capacity tests were conducted in select shallow and intermediate wells (UFIW-06S, UFIW-06I, UFMW-05S, and UFMW-06S) to estimate location-specific hydraulic conductivity in the Qal, as well as provide a comparison of specific capacity hydraulic conductivity values with corresponding slug test hydraulic conductivity estimates. Pre-injection specific capacity testing was conducted in September 2016 on wells UFIW-06S, UFIW-06I and post-injection specific capacity tests were conducted on wells UFMW-05S, and UFMW-06S in October 2017 (*Table 29*). Post-injection testing was limited to monitoring wells as injection wells had affixed wellheads fittings that would not allow pump placement that is required for the specific capacity testing. The methods used to conduct the specific capacity tests are described in Section 4.2.4.

Following the completion of the slug tests and specific capacity tests, the test data were downloaded from the transducer or entered from field data sheets, and analyzed using AQTESOLV software (HydroSOLVE, Inc., 2007). The Bouwer and Rice method for analyzing slug tests in an unconfined aquifer was used to estimate hydraulic conductivity (Bouwer & Rice, 1976), while the specific capacity test data was were analyzed using the Theis method (Theis, 1935), Hantush-Jacob leaky aquifer solution (Hantush, 1955) or Cooper-Jacob unconfined solution (Cooper, 1946). Results obtained from the slug and specific capacity testing, which includes the AQTESOLV interpretation plots, are provided in Appendix C. If recovery times at each well allowed (i.e. wells with higher K values), multiple tests were conducted and the corresponding hydraulic conductivity estimates were averaged. *Table 29* and *Table 30* summarize the mean hydraulic conductivities for the shallow, intermediate and deep wells based on the specific capacity test and slug test results, respectively.

Table 29 Shallow Specific Capacity Test Results - Chemical Reduction Study

	Mean Hydraulic Conductivity (feet/day)			
Well	Pre-Injection (September 2016)	Post-Treatability Study (October 2017)		
UFIW-06S	8.0			
UFIW-06I	0.8			
UFMW-05S		16.8		
UFMW-06S		15.6		

Table 30 Intermediate and Deep Slug Test Results – Chemical Reduction Study

	Mean Hydraulic Conductivity (feet/day)					
Well	Pre-Injection (December 2016)	Pre-Injection (April 2017)	Post-Treatability Study (October/November 2017)			
UFIW-01I	9.7	0.3	1.4			
UFIW-01D	1.9					
UFIW-02I	1.0					
UFIW-02D	1.4					
UFIW-03I	11.3					
UFIW-03D	7.3					
UFIW-04I	12.9	1.3	1.9			
UFIW-04D	4.6					
UFIW-05I	4.9	2.2	0.9			
UFIW-05D	0.5					
UFIW-06I	2.5					
UFIW-06D	0.9					
UFIW-07I	3.7					
UFIW-07D	2.1					
UFIW-08I	2.7	0.4	0.4			
UFIW-08D	1.2					
UFMW-01I	1.3	1.9	1.9			
UFMW-01D	1.8		3.0			
UFMW-02I	1.0		1.1			
UFMW-02D	1.1		1.4			
UFMW-03I	1.8	1.6	1.8			
UFMW-03D	1.5		1.8			
UFMW-04I	2.6	3.4	4.8			
UFMW-04D	4.6		5.4			
UFMW-05I	1.1		1.9			
UFMW-05D	4.3		5.1			
UFMW-06I	3.2	3.1	4.8			
UFMW-06D	1.2		1.0			

68

Based on the slug test results, the estimated Ks are generally consistent with the lithologies observed within the screened interval of the wells: primarily silty sand to sandy silt. Prior estimates of the hydraulic conductivity for the UMCf have ranged from less than 0.01 ft/d to more than 10 ft/d. The estimates from the chemical reduction study area slug tests ranged from 0.3 to 12.9 ft/d, which are consistent with the previous estimated range for the UMCf. In addition, data from the injection testing in the chemical reduction study area confirmed that many of the wells were capable of sustaining injection rates of 1-3 gallons per minute each (Section 4.2.5), which is consistent with likely injection rates based on the hydraulic conductivity range estimated from slug testing. Results of the specific capacity tests revealed that the specific capacity K estimates in intermediate well UFIW-06I are similar to the corresponding slug test K estimates from the same well. Additionally, the specific capacity test results from the shallow wells are likely to be heavily influenced by saturated thickness, since less than 2 feet of saturated thickness exists in the shallow wells. Therefore, the specific capacity K estimates from the shallow wells are not likely representative of the overall K of the Qal.

Based on the data, a decrease in K was observed in several injection wells, including UFIW-01I, UFIW-04I, UFIW-05I, and UFIW-08I, where post-injection K values were calculated to be approximately an order of magnitude lower (UFIW-01I and UFIW-04I) than pre-injection K values. Post-injection K values for wells UFIW-05I and UFIW-08I also showed small decreases compared with the corresponding pre-injection K values. However, no significant changes were observed between the K estimates before and after injection occurred in the monitoring wells tested, indicating any decreases in K associated with injection testing were likely limited to the immediate vicinity of the injection wells.

6.0 SUMMARY OF KEY FINDINGS

This section presents a summary of the key findings of the biological and chemical reduction studies and also provides considerations for large-scale implementation of in-situ remediation of hexavalent chromium and other COPCs within the treatability study areas.

6.1 BIOLOGICAL REDUCTION STUDY

The following list provides several key findings of the biological reduction study.

- Carbon substrates can be successfully injected into the Qal through the use of permanent injection wells.
 Within the Qal, injection flow rates ranged from 1.3 to 4.7 gpm and injection pressures ranged from 0 to 20 psig. Injection rates and pressures did not significantly change at the injection wells between the three injection events.
- Carbon substrates can be successfully injected into the UMCf through the use of permanent injection
 wells. Within the UMCf, injection flow rates ranged from 1.2 to 8.6 gpm and injection pressures ranged
 from 0 to 16 psig. Injection rates and pressures did not significantly change at the injection wells between
 the three injection events.
- Aquifer testing did not indicate a significant change in hydraulic conductivity at the injection or downgradient monitoring wells, with the exception of CTIW-02D, which decreased from approximately 1 ft/d to 0.1 ft/d, and CTMW-01S and CTMW-02S, where decreases were largely attributed to a decrease in saturated thickness.
- The biological reduction study demonstrated effective and rapid reduction of hexavalent chromium in groundwater within the Qal (maximum first-order degradation rate of -0.37 day⁻¹). Hexavalent chromium concentrations decreased from approximately 11 mg/L to below 0.01 mg/L in groundwater at four of the six monitoring wells, located up to 34 feet downgradient of the injection wells within approximately 2 months (CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S). The hexavalent chromium concentrations in groundwater at four shallow monitoring wells remained below 0.01 mg/L through the end of the treatability study, approximately 6 months following the initial injection event. The significant reduction in hexavalent chromium reduction in groundwater within the Qal is largely attributed to the relatively fast groundwater flow velocity of approximately 5.6 to 13.2 ft/d and the ability to rapidly create and maintain reducing conditions. Monitoring wells CTMW-03S and CTMW-05S, located slightly crossgradient of the injection wells based on projected groundwater flow directions and therefore apparently located at the western edge of injection influence, did not exhibit the same level of reduction as the other monitoring wells (Figure 7a; Appendix G).
- The biological reduction study also achieved reductions of hexavalent chromium in groundwater within the UMCf. However, these reductions were much slower than and not as extensive as for groundwater within the Qal (maximum first-order degradation rate of -0.005 day⁻¹). At the end of the biological reduction study, approximately 6 months following the initial injection event, the concentrations of hexavalent chromium were still trending downwards in groundwater at several downgradient deep monitoring wells that showed influence of increased TOC (CTMW-01D, CTMW-02D, and CTMW-06D) (Figure 7b; Appendix G). However, groundwater adjacent to the remaining deep wells (CTMW-03D, CTMW-04D, and CTMW-05D) did not show evidence of reductions in hexavalent chromium concentrations. This is likely a result of the slow and non-uniform movement of groundwater within the UMCf at an estimated groundwater flow velocity of approximately 0.14 to 0.46 ft/d.
- In addition to the observed chromium reductions, the biological reduction study achieved effective reduction of perchlorate, chlorate and chloroform in groundwater within the Qal (maximum first-order degradation rates of -0.05 day⁻¹, -0.10 day⁻¹, and -0.02 day⁻¹, respectively). As described above, the rapid

70

movement of groundwater and TOC in the Qal led to the creation of reducing conditions in groundwater at four of the downgradient monitoring wells (CTMW-01S, CTMW-02S, CTMW-04S, and CTMW-06S) that corresponded to decreases of perchlorate, chlorate, and chloroform in groundwater adjacent to these wells. Groundwater adjacent to wells CTMW-03S and CTMW-05S, located slightly cross-gradient of the injection wells based on projected groundwater flow directions and therefore apparently located at the western edge of the injection influence, did not exhibit the same level of reduction as the other monitoring wells (Figure 8a; Appendix G).

• The biological reduction study also demonstrated some reductions of chlorate and chloroform in groundwater within the UMCf. However, these reductions were not as rapid or as extensive as they were for groundwater within the Qal (maximum first-order degradation rates of -0.002 day⁻¹ and -0.002 day⁻¹, respectively). At the end of the biological reduction study, the concentrations of chlorate were still trending downwards in groundwater adjacent to three deep monitoring wells (CTMW-01D, CTMW-02D, and CTMW-06D), all of which showed an influence of increased TOC from the study. It is anticipated the perchlorate and chloroform would degrade following hexavalent chromium, nitrate, and chlorate degradation. Groundwater adjacent to the remaining monitoring wells (CTMW-03D, CTMW-04D, and CTMW-05D) did not show increased TOC concentrations and did not exhibit reduction of chlorate, perchlorate, or chloroform, likely due to being located at the western edge of the injection influence (Figure 8b; Appendix G).

6.2 CHEMICAL REDUCTION STUDY

The following are key findings of the chemical reduction study:

- CPS (10% solution by weight) can be successfully injected into the Qal and UMCf through the use of
 permanent injection wells. Within the Qal, injection flow rates ranged from 4.5 to 4.6 gpm and injection
 pressures ranged from 5 to 22 psig. Within the UMCf, injection flow rates ranged from 4.1 to 5.6 gpm and
 injection pressures ranged from 1 to 17 psig.
- The chemical reduction study demonstrated hexavalent chromium reduction in groundwater within the UMCf but not within the Qal. Within the UMCf, hexavalent chromium concentrations decreased by 67% to 99% in groundwater at five of the six intermediate monitoring wells when compared to baseline concentrations. Within the Qal, hexavalent chromium concentrations were reduced in groundwater at only one of the six shallow monitoring wells when compared to baseline concentrations. The limited reduction in hexavalent chromium concentrations within the Qal is largely attributed to the limited water present in the Qal, with three of the six shallow monitoring wells going dry by the final sampling event conducted in October 2017, as well as the low baseline concentrations.

6.3 COST CONSIDERATIONS FOR IMPLEMENTATION

The In-situ Chromium Treatability Study provided information useful for developing preliminary indications of the costs of future implementation. As requested by NDEP, these preliminary indications are presented in the following subsections, but are subject to significant revision during the Feasibility Study (FS). During the FS, NERT will evaluate the applicability of a variety of remedial technologies in order to achieve the RAOs established for the Site. If in-situ biological reduction of hexavalent chromium and other COPCs is selected as a component of the Final Remedy, a detailed cost estimate will be prepared.

6.3.1 Treatability Study Cost Summary

Table 31 provides a high-level cost summary for implementation of this treatability study which was completed within the approved budget. It should be noted that costs for treatability studies can vary tremendously and are directly related to the type of study, extent of monitoring, and length of the study. Data obtained and costs

incurred during the treatability study will be used to inform the development of alternative costs in the FS; however, due to the nature of treatability studies, costs are inherently higher than likely larger scale operations, and cannot be easily extrapolated to represent larger-scale system design, installation, and operational costs. These costs for implementing the treatability study should not be used for developing full-scale implementation costs on a per-well basis. For example, treatment footprints, durations, and associated operational costs will vary significantly depending on the specific risk-based remedial action goals established during the FS and other alternative implementation and operational variables that have not yet been defined.

Table 31 In-Situ Chromium Treatability Study Cost Summary

Task	Approximate Cost
Work Plan Preparation	\$100,000
Initial Field and Bench-Scale Studies	\$300,000
Design and Permitting	\$100,000
Injection and Monitoring Well Installation	\$250,000
Carbon Substrate Injections	\$250,000
Groundwater Monitoring and Aquifer Testing	\$250,000
Data Analysis and Reporting	\$200,000
Well Abandonment	\$50,000
Total	\$1,500,000

6.3.2 Preliminary Indications of Costs for In-situ Biological Reduction

Based on the findings of this treatability study, an in-situ biological approach would be preferred over a chemical reduction approach. Accordingly, the preliminary indications of costs provided in this section represent estimates for the implementation of in-situ biological reduction and should not be considered highly accurate remediation cost estimates.

Detailed costs will vary significantly depending on the RAOs for the Site and other variables of the final remedy that have not yet been defined. These include, but are not limited to, the following:

- Extent of areas selected for in-situ biological reduction;
- Depths in each area selected for in-situ biological reduction;
- Presence of buildings or other surface structures in the selected areas which make the installation of and access to injection wells more difficult; and,
- Extent to which soil flushing will be implemented in the selected areas, which will tend to reduce the cost of remediation of the Qal.

As discussed above, there are many factors that require further analysis in order to more accurately estimate the cost of implementing in-situ biological reduction of hexavalent chromium and other COPCs at the NERT site. Similarly, it is not traditionally the objective of a treatability study to estimate the cost of a remedial technology. NERT is still conducting the Remedial Investigation, and the FS has not begun. During the FS, NERT will evaluate the applicability of a variety of remedial technologies in order to achieve the RAOs established for the Site. Accordingly, the cost estimates provided in this section are subject to significant revision during the FS. The cost estimates provided herein are considered to have an accuracy range of approximately -50% / +100%, typical of conceptual-level estimates. All estimates are in 2017 dollars.

As described, there are several important considerations with respect to the implementation and costs for in-situ biological reduction of hexavalent chromium and other COPCs. The most important considerations relate to the final RAOs and the implementation configuration, areal extent and depths.

For the configuration of in-situ biological reduction transects designed to contain downgradient migration, it is estimated that the design, installation, and startup costs per 1,000 linear feet of transect could be approximately \$300,000 to \$1,200,000, and the operating costs could be approximately \$150,000 to \$600,000 per year per 1,000 linear feet of transect. The duration of the operations would be influenced by the number of transects. For example, a single transect might have an indefinite period of operations, because its duration would be controlled by the very slow rate at which COPCs would naturally leach through and out of the UMCf. On the other hand, if transects were installed at varying distances, such as every 100 feet across the plume, the duration of operation might be reduced.

These estimates are based on the following design concepts and assumptions:

- · Maximum well depth of 60 feet bgs;
- Twenty to thirty injection wells installed at shallow and deep depths;
- Two batch injections per year (after initial year which will have four injections); and,
- Groundwater sampling conducted at five wells every quarter.

For the configuration of an in-situ biological reduction grid-type design intended to emphasize source control or reduction in addition to plume containment, it is estimated that the design, installation and start-up costs could be approximately \$400,000 to \$1,200,000 per acre and the operating costs could be approximately \$100,000 to \$400,000 per year per acre. The annual costs would tend to be higher initially and then stabilize once a biologically activated zone is established in the subsurface and less frequent re-injections are needed. The duration of the operation would be influenced by the RAO expectations for source control or reduction. It would also be influenced by whether the grid design is applied extensively enough to eliminate COPCs from migrating from upgradient into areas treated by the grid.

These estimates are based on the following design concepts and assumptions:

- Maximum well depth of 60 feet bgs;
- 27 injection wells installed at shallow and deep depths per acre (approximately 40-foot spacing);
- Two batch injections per year (after initial year which will have four injections);
- Groundwater sampling conducted at two wells every quarter per acre; and
- 50 or more acres.

An alternate configuration of implementing a hybrid in-situ biological reduction and groundwater extraction approach to enhance in-situ mixing of carbon substrate and COPCs in groundwater, such as what is being evaluated as part of the Unit 4 Source Area In-Situ Bioremediation Treatability Study, could significantly improve

the effectiveness of in-situ biological reduction in the UMCf and reduce its duration of operation and overall cost. However, this concept is outside the scope of the cost projections provided above.

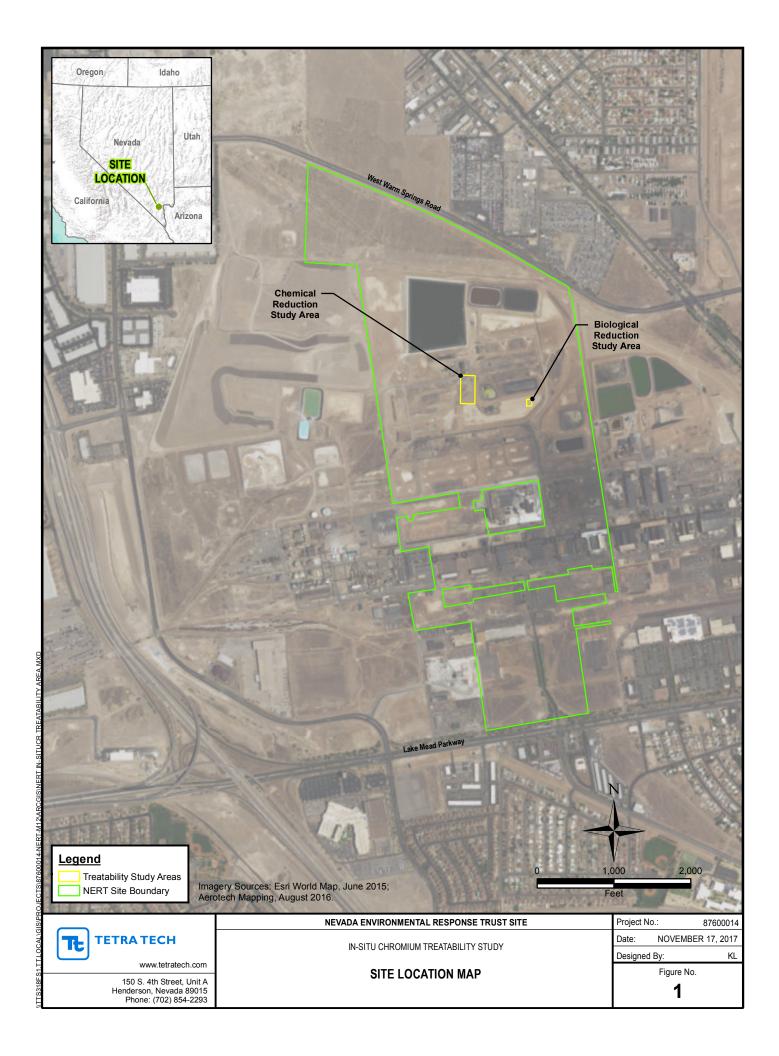
7.0 REFERENCES

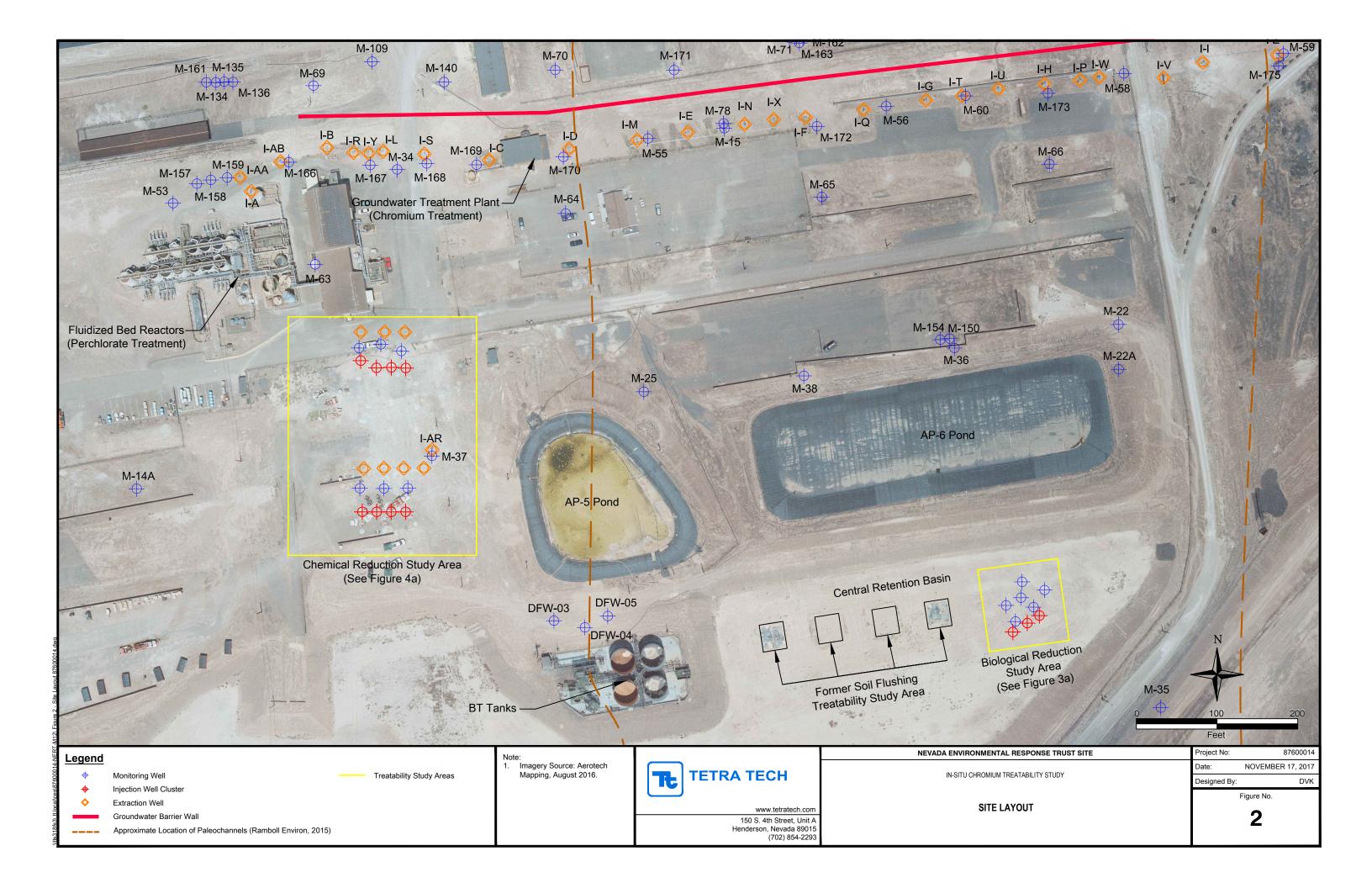
- ASTM International. (2008). Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.
- ASTM International. (2009). Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Standard D-2488-09.
- ASTM International. (2009). Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Standard D-2488-09.
- Blessing, T. C., & Rouse, J. V. (2002). Keys to Successful In-Situ Remediation of Cr(VI) in Soil and Ground Water.
- Borden, R., Ng, G., Kent, D., Tillotson, J., Bekins, B., & Curtis, G. (2015). Extent and Persistence of Secondary Water Quality Impacts after Enhanced Reductive Bioremediation.
- Bouwer, E., & McCarty, P. (1983). Transformation of Halogenated Organic Compounds under Denitrifying Conditions. *Applied and Environmental Microbiology*, 1295-1299.
- Bouwer, H., & Rice, R. (1976). A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. *Water Resources Research*, 12(3).
- Capppelletti, M., Frascari, D., Zannoni, D., & Fedi, S. (2012). Mini-Review: Microbial Degradation of Chloroform. *Applied Microbiology and Biotechnology*, 1395-1409.
- Chen, Z., Zhao, Y. Z., & Bai, J. (2015). Mechanism and Kinetics of Hexavalent Chromium Chemical Reduction with Sugarcane Molasses.
- Coates, J., Michaelidou, R., Bruce, S., O'Connor, J., Crespi, J., & Achenbach, L. (1999). Ubiquity and Diversity of Dissimilatory Perchlorate-Reducing Bacteria. *Applied and Environmental Microbiology, 65*(12), 5234-41.
- Cooper, H. a. (1946). A generalized graphical method for evaluating formation constants and summarizing well field history. *Am. Geophys. Union Trans.*, vol. 27, pp. 526-534.
- Duffield, G. M. (2014). AQTESOLV for Windows Version 4.5 Users Guide.
- ENVIRON. (2014a). Remedial Investigation and Feasibility Study Work Plan, Revision 2, Nevada Environmental Response Trust Site, Henderson, Nevada.
- ENVIRON. (2014b). Field Guidance Document No. 001, Managing Investigation-Derived Waste.
- Fendorf, S., Hansel, C., & Wielinga, B. (2002). Operative pathways of chromate and uranyl reduction within soils and sediments.
- Fowler, T. B. (2011). Acetone and 2-Butanone Creation Associated with Biological and Chemical Remediation of Environmental Contamination. *Remediation*.
- Fredrickson, J., Kostandarithes, H., Li, S., Plymale, A., & Daly, M. (2000). Reduction of Fe(III), Cr(VI), U(VI), and Tc(VII) by Deinococcus radiodurans R1. *Applied and Environmental Microbiology*, *66*(5), 2006-2011.
- Freedman, D., Lehmicke, L., & Verce, M. (2005). Reductive dechlorination of tetrachloroethene following abiotic versus biotic reduction of hexavalent chromium. *Bioremediation Journal*, *9*(2), 87-97.
- Graham, M., Farmer, J., Anderson, P., Paterson, E., Hillier, S., & Lumsdon, D. (2006). Calcium polysulfide remediation of hexavalent chromium contamination from chromite ore processing residue. *Science of the Total Environment*, 364(1-3), 32-44.

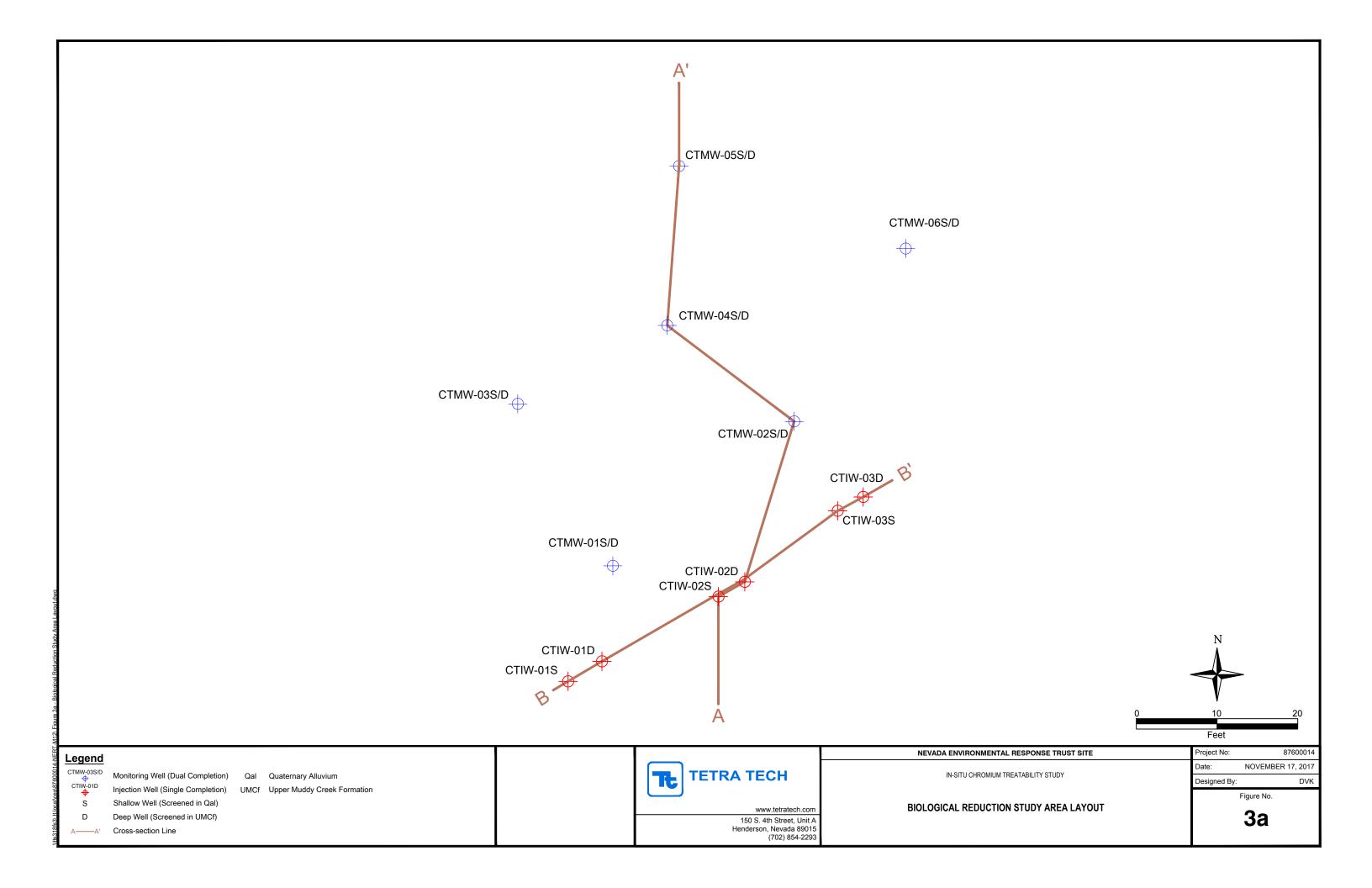
- Guertin, J., Jacobs, J., & Avakian, C. (2005). *Chromium(VI) Handbook. Independent Environmental Technical Evaluation Group (IETEG).* New York: CRC Press.
- Hantush, M. a. (1955). Non-steady radial flow in an infinite leaky aquifer. *Am. Geophys. Union Trans.*, vol. 36, pp. 95-100.
- HydroSOLVE, Inc. (2007). AQTESOLV (Version 4.50) Professional. (D. b. Duffield, Ed.)
- Lovely, D. (1993). Dissimilatory Metal Reduction. Annual Microbiology Review, 47, 263-290.
- Lovely, D., & Coates, J. (1997). Bioremediation of Metal Contamination. *Current Opinion in Biotechnology, 8*, 285-289.
- Messer, A., Storch, P., & Palmer, D. (2003). In-situ remediation of a chromium-contaminated site using calcium polysulfide. *Southwest Hydrology*, 7-8.
- Padzadeh, B., & Batista, J. R. (2011). Chromium Removal from Ion-Exchange Waste Brines with Calcium Polysulfide.
- Perlmutter, M. W. (2001). In situ biotreatment of perchlorate and chromium in groundwater.
- Pettine, M., D'ottone, L., Campanella, L., Millero, F., & Passino, R. (1998). The reduction of chromium(VI) by iron(II) in aqueous solutions. *Geochimica et Cosmochimica Acta*, *62*(9), 1509-1519.
- Plume, R. (1989). Ground-Water Conditions in Las Vegas Valley, Clark County, Nevada. Part 1: Hydrologic Framework.
- Ramboll Environ. (2015). Annual Remedial Performance Report for Chromium and Perchlorate, Nevada Environmental Response Trust Site, Henderson, Nevada.
- Ramboll Environ. (2016). Remedial Investigation Data Evaluation, Nevada Environmental Response Trust Site, Henderson, Nevada. Technical Memorandum.
- Ramboll Environ. (2017). Annual Remedial Performance Report for Chromium and Perchlorate, Nevada Environmental Response Trust Site, Henderson, Nevada.
- Sass, B., & D. Rai. (1987). Solubility of amorphous chromium(III)-iron(III) hydroxide solid solutions.
- Sass, B., & Rai, D. (1987). Solubility of amorphous chromium(III)-iron(III) hydroxide solid solutions.
- Solutions-IES, Inc. (2006). SERDP-ESTCP. Retrieved May 2006, from https://www.serdp-estcp.org/Tools-and-Training/Environmental-Restoration/Groundwater-Plume-Treatment/Protocol-for-Enhanced-In-Situ-Bioremediation-Using-Emulsified-Edible-Oil.
- Storch, P., Messer, A., Palmer, D., & Pyrih, R. (2002). Pilot test for in-situ geochemical fixation of chromium(VI) using calcium polysulfide. *Proceedings of the Third International Conference on Remediaton of Chlorinated and Recalcitrant Compounds*. Monterey, CA: Battelle Press.
- Tebo, B., & Obraztsova, A. (1998). Sulfate-reducing bacterium grows with Cr(VI), U(VI), Mn(IV), and Fe(III) as electron acceptors. *FEMS Microbiology Letters*, *162(1)*, 193-199.
- Tetra Tech, Inc. (2016a). *In-Situ Chromium Treatability Study Work Plan, Nevada Environmental Response Trust, Henderson, Nevada.*
- Tetra Tech, Inc. (2016b). Groundwater Bioremediation Treatability Study Results Report, Nevada Environmental Response Trust, Henderson, Nevada.
- Tetra Tech, Inc. (2017). CTMW-07D and CTMW-07S Well Installation, Technical Memorandum, Nevada Environmental Response Trust, Henderson, Nevada.

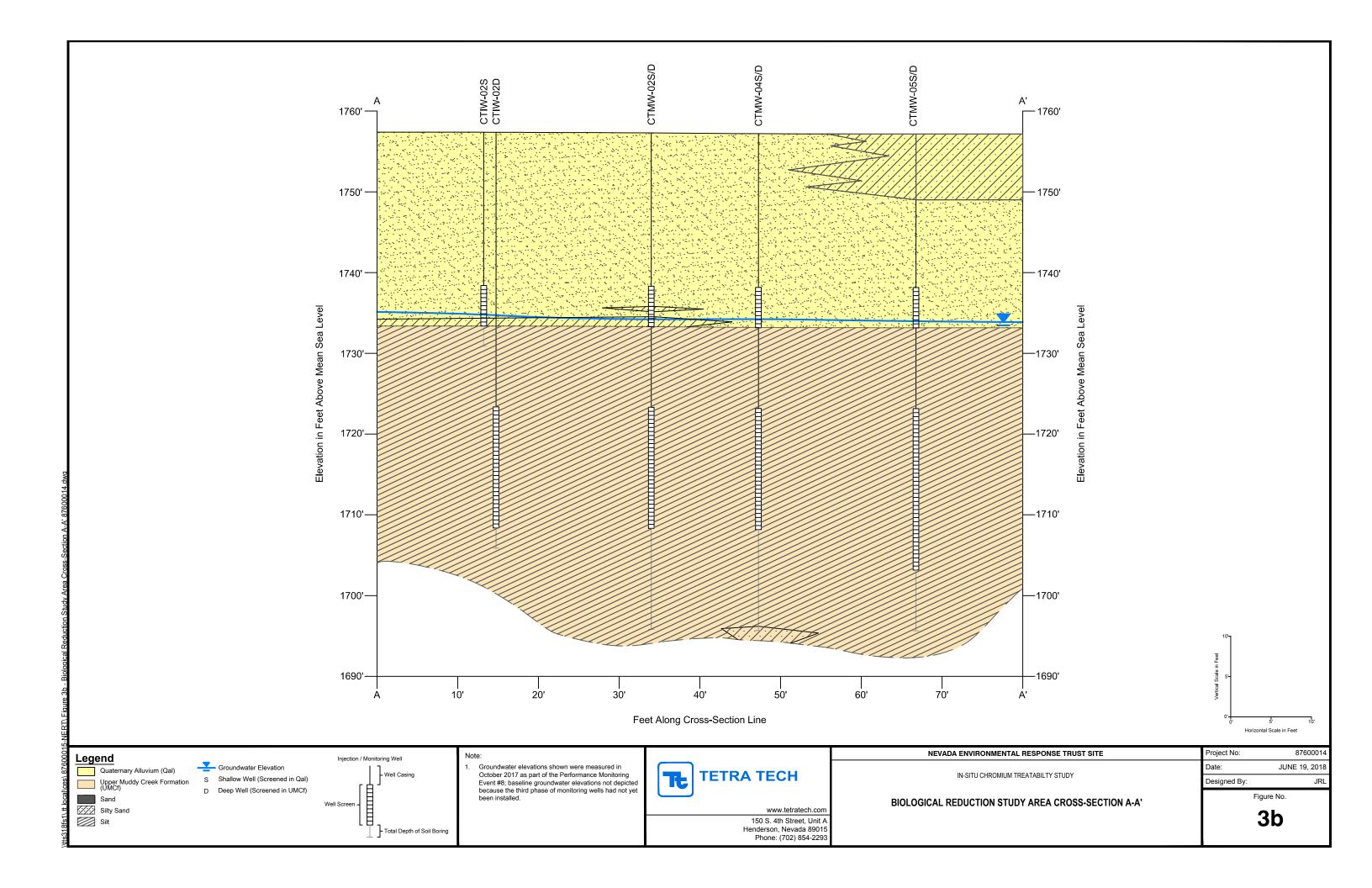
- The Interstate Technology & Regulatory Council. (2008). Remediation Technologies for Perchlorate Contamination in Water and Soil.
- Theis, C. (1935). The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage. *Am. Geophys. Union Trans.*, vol. 16, pp. 519-524.
- Tronox, LLC. (2010). Technical Memo, Hydrogeology Model, Henderson, Nevada.
- Wielinga, B., Mizuba, M., Hansel, C., & Fendorf, S. (2001). Iron promoted reduction of chromate by dissimilatory iron-reducing bacteria.
- Yu, G., & Tremaine, J. (2002). Pilot testing using CASCADE to treat Cr(VI) in groundwater of a carbonate aquifer. The Second International Conference on Oxidation and Reduction Technologies for In-Situ Treatment of Soil and Groundwater. Toronto, Ontario, Canada.

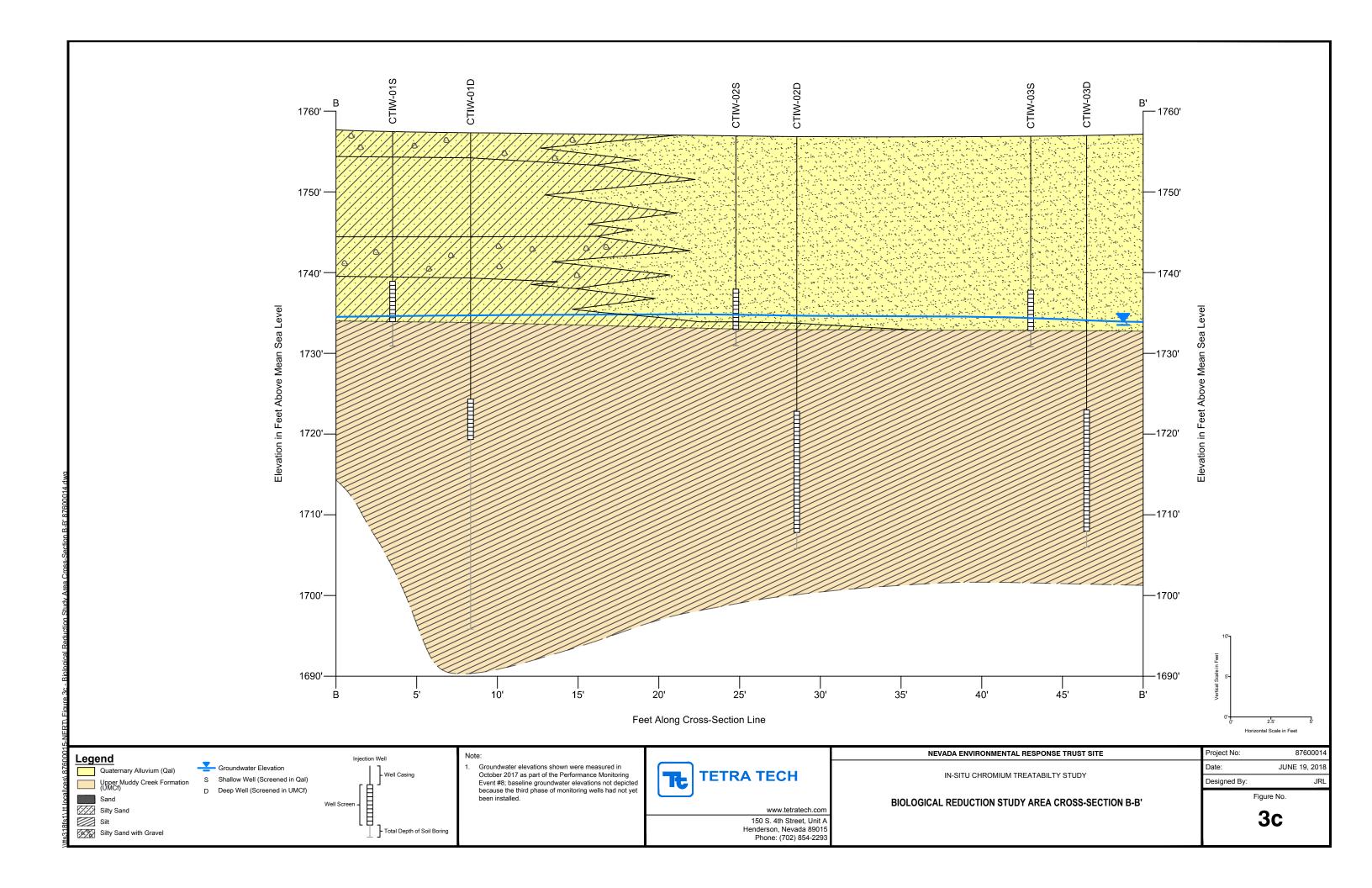
Figures

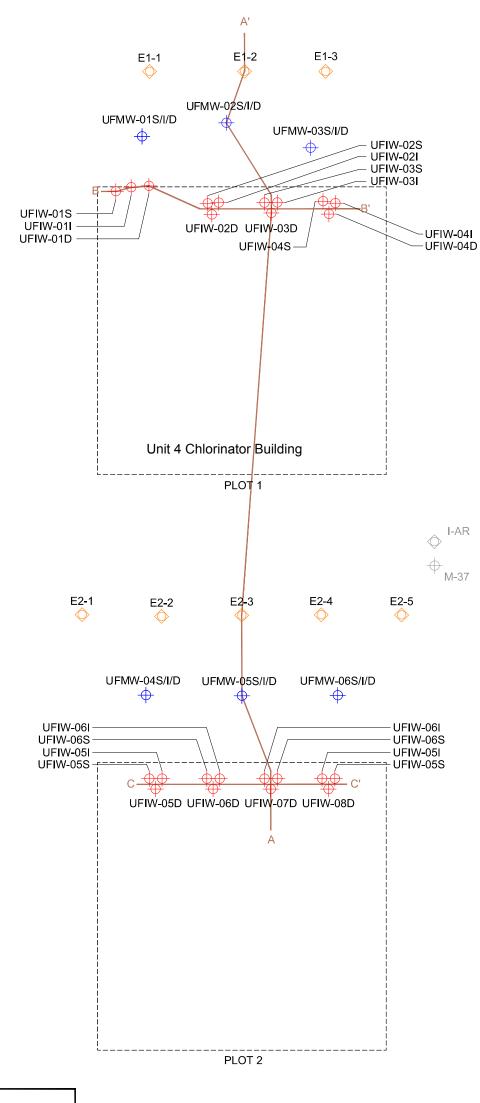


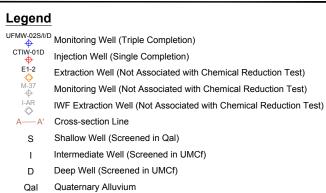


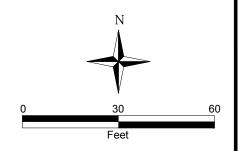












Project No:

Date:

TETRA TECH Tt

NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

IN-SITU CHROMIUM TREATABILITY STUDY

Designed By: Figure No. 4a

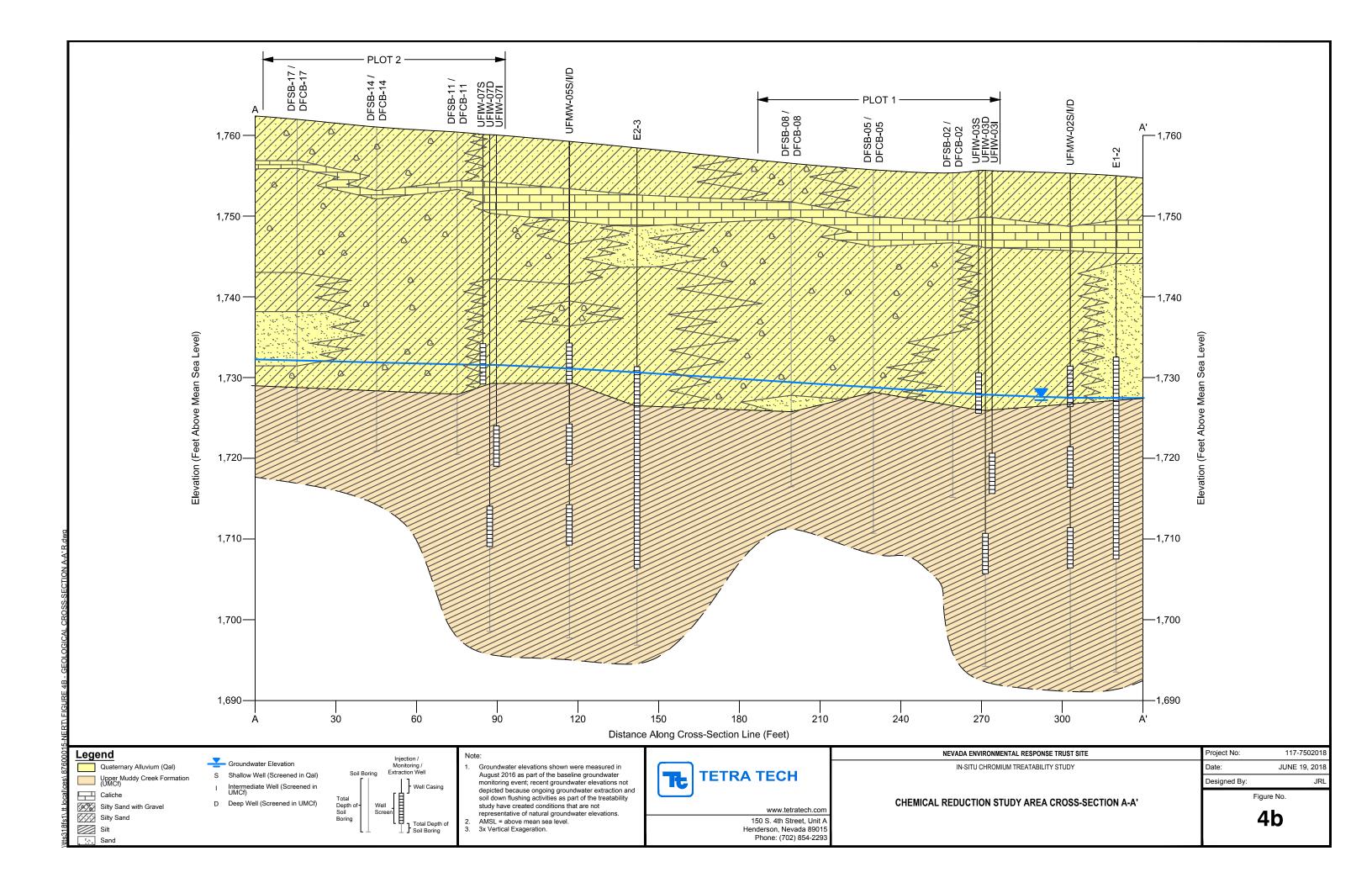
87600014

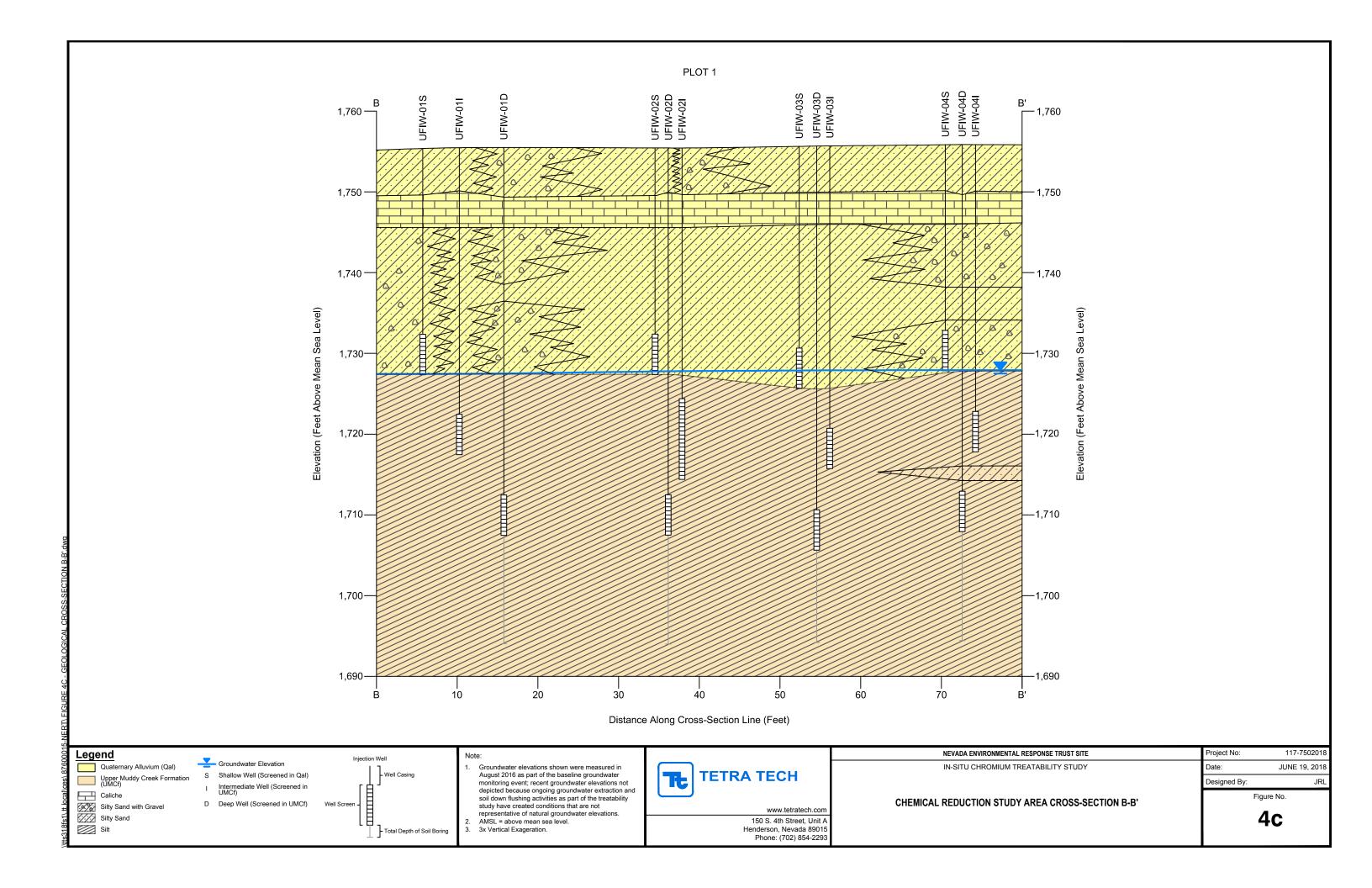
NOVEMBER 17, 2017

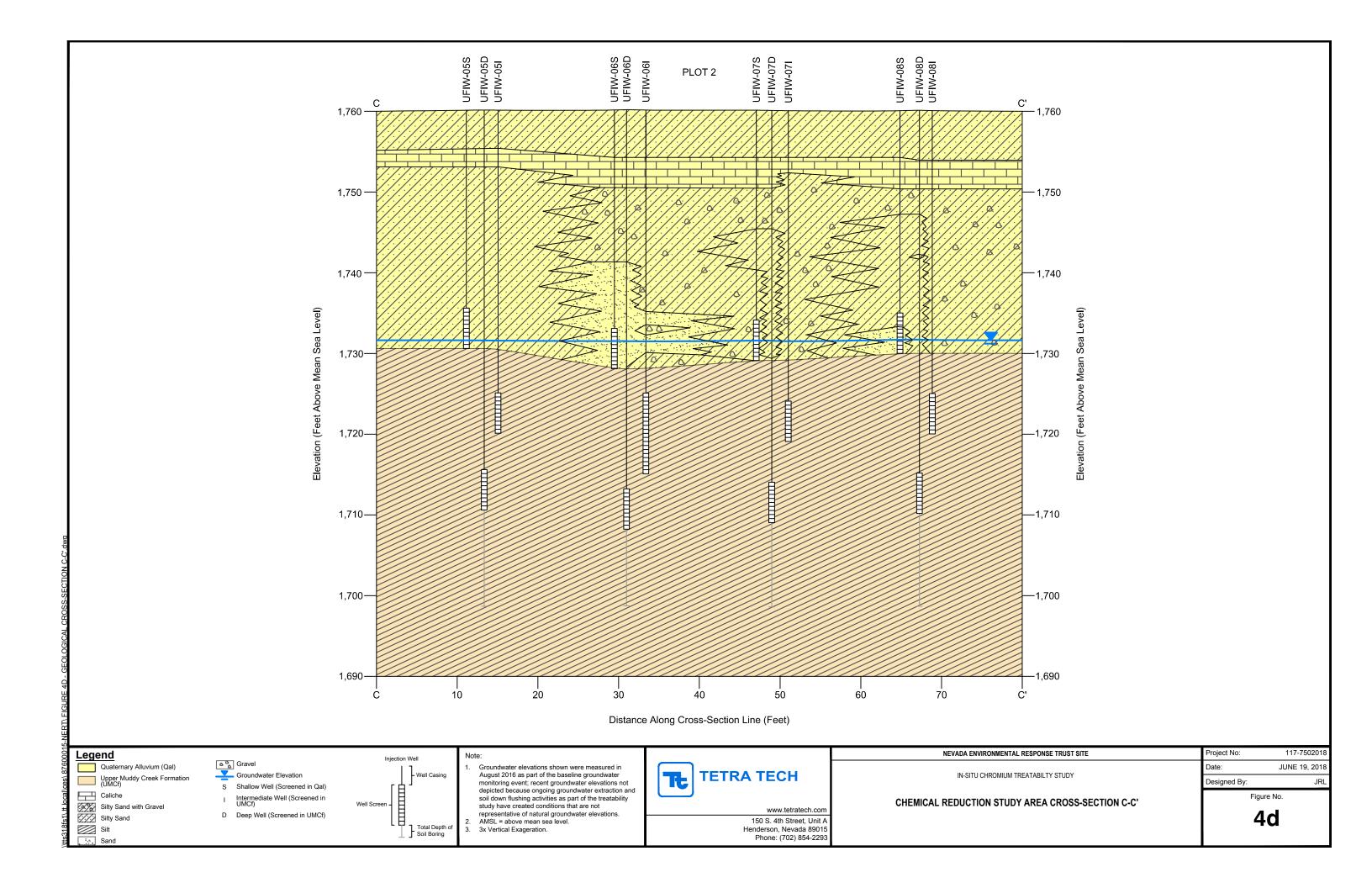
CHEMICAL REDUCTION STUDY AREA LAYOUT

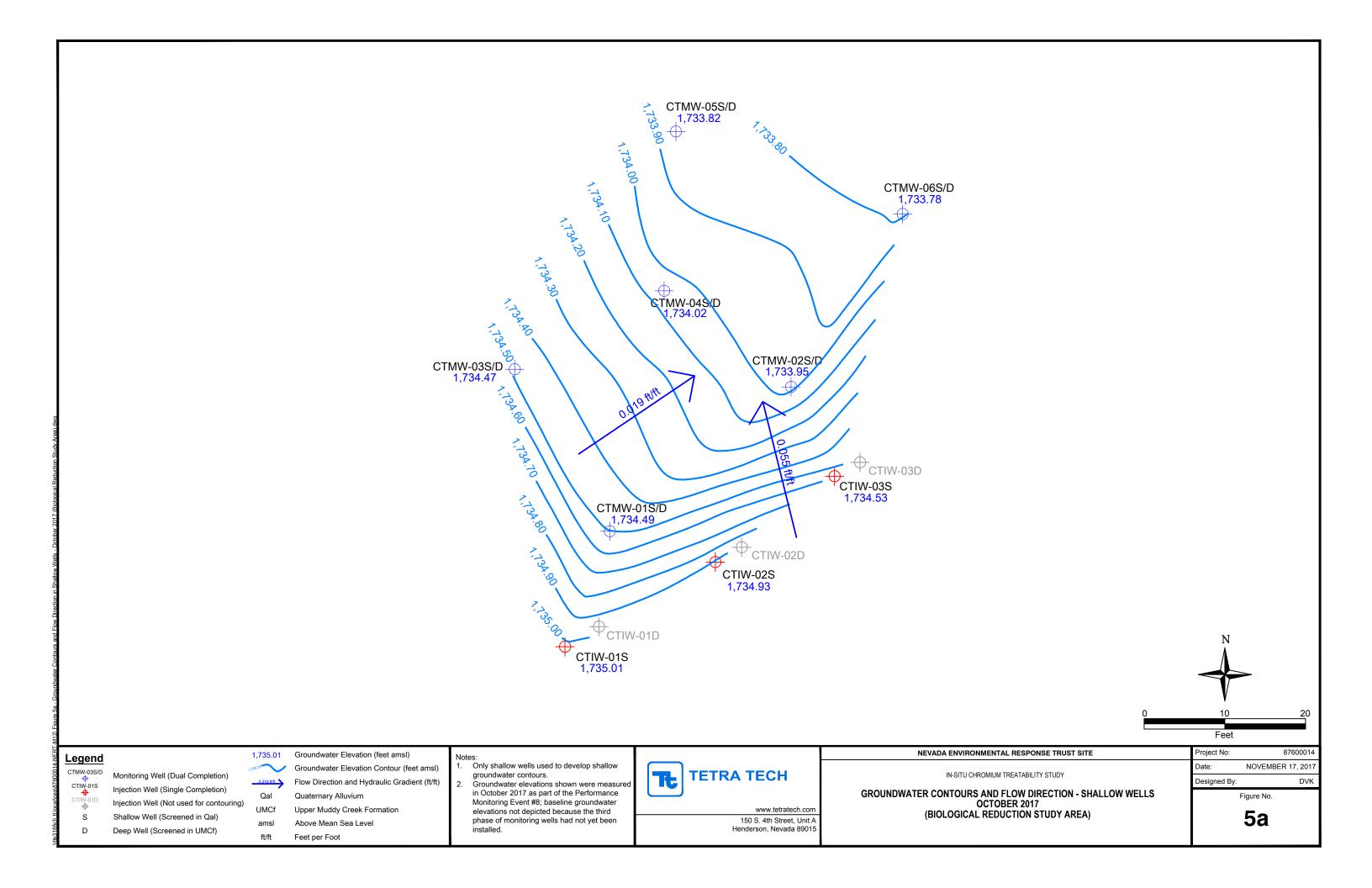
www.tetratech.com 150 S. 4th Street, Unit A Henderson, Nevada 89015 (702) 854-2293

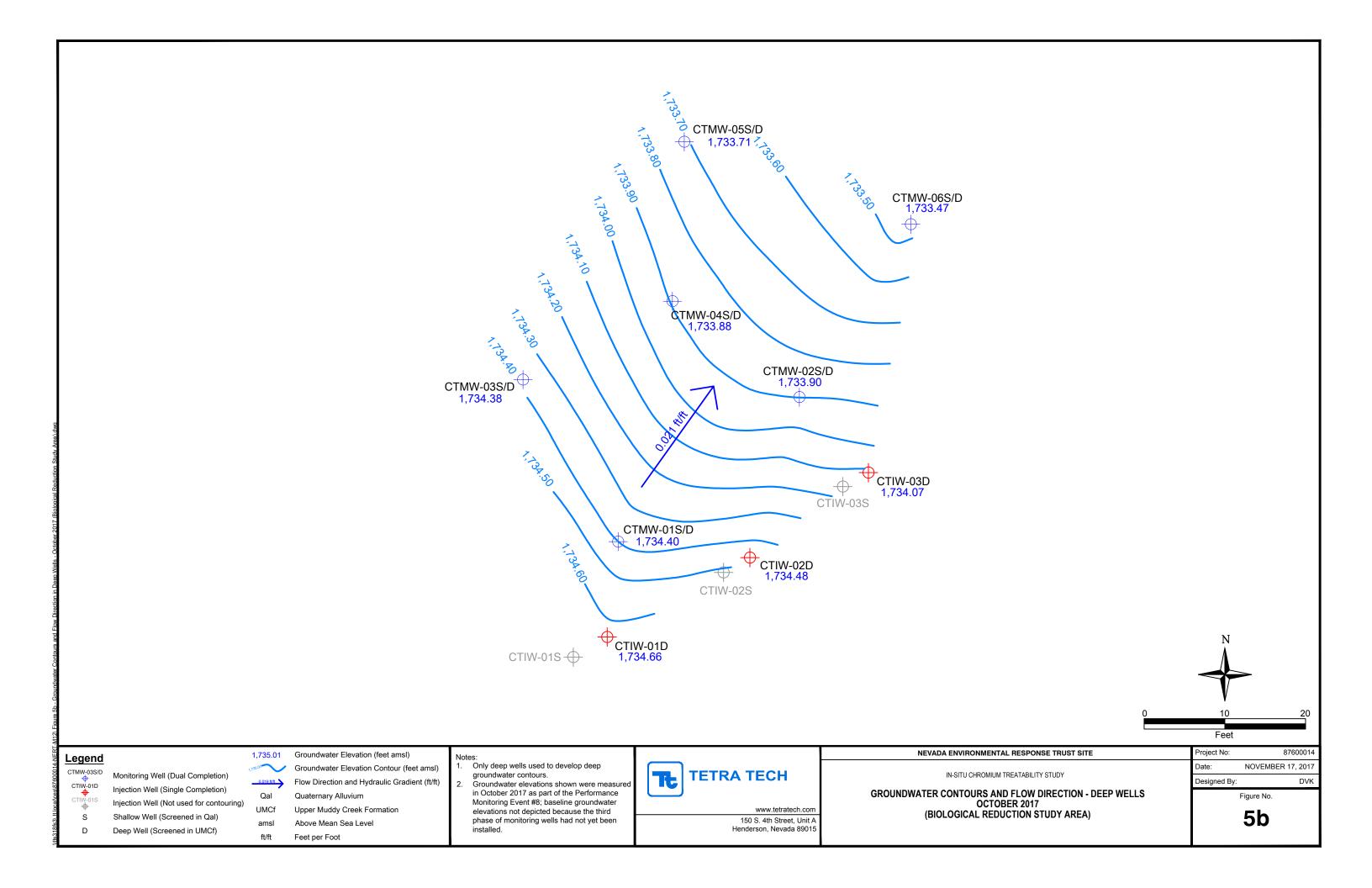
UMCf Upper Muddy Creek Formation

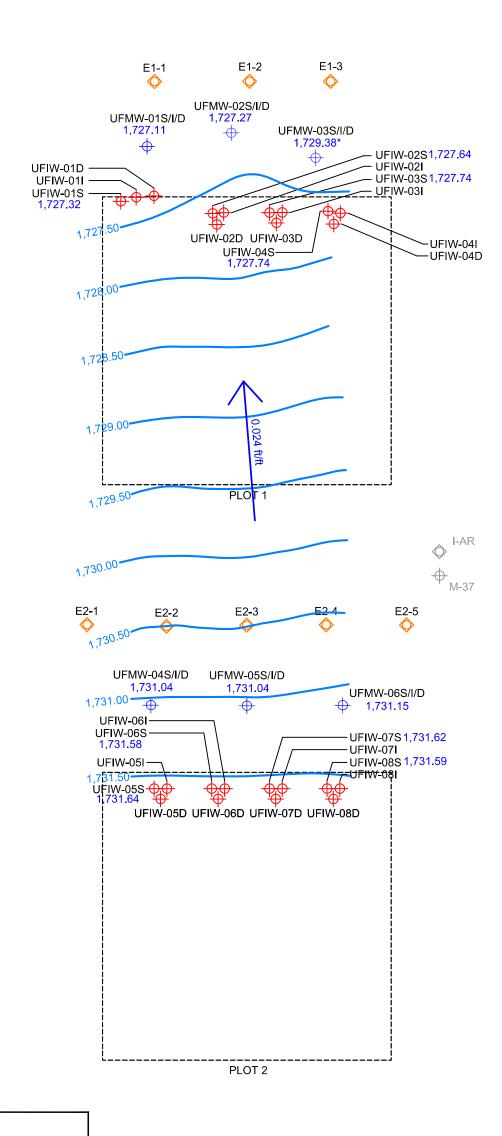












Legend

S

D

UFMW-02S/I/D → Monitoring Well (Triple Completion)
CTIW-01S → Injection Well (Single Completion)

E1-2 Extraction Well (Not Associated with Chemical Reduction Study)

M-37 Monitoring Well (Not Associated with Chemical Reduction Study)
LAR VIWF Extraction Well (Not Associated with Chemical Reduction Study)

1,731.64 Groundwater Elevation (feet amsl) Groundwater Elevation Contour (feet amsl)

Flow Direction and Hydraulic Gradient (ft/ft)
Shallow Well (Screened in Qal)

Intermediate Well (Screened in UMCf)

www.tetratech.com

(702) 854-2293

150 S. 4th Street, Unit A Henderson, Nevada 89015

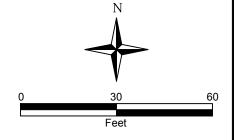
Deep Well (Screened in UMCf) Quaternary Alluvium Upper Muddy Creek Formation

Qal UMCf

Above Mean Sea Level

Feet per Foot Groundwater elevation not used in developing contours

- Only shallow wells were used to develop shallow groundwater contours.
- Groundwater elevations shown were measured in August 2016; recent groundwater elevations not depicted because ongoing groundwater extraction and soil flushing activities as part of the AP Area Treatability Study have created conditions that are not as representative of natural groundwater elevations.



Project No:

Date:



IN-SITU CHROMIUM TREATABILITY STUDY

GROUNDWATER CONTOURS AND FLOW DIRECTION - SHALLOW WELLS

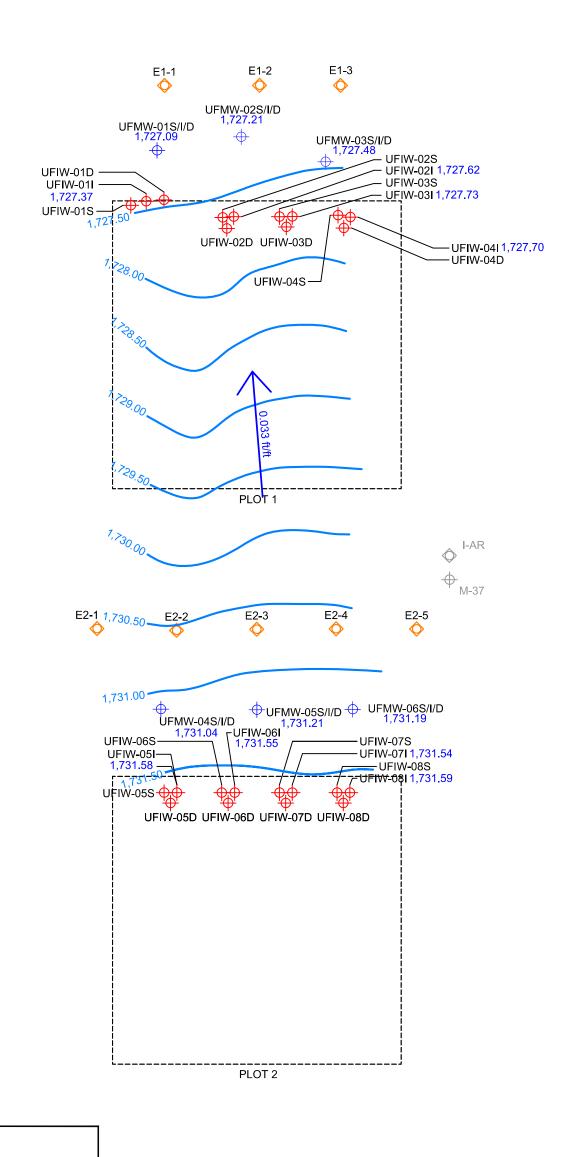
NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

Designed By: Figure No. 6a

87600014

NOVEMBER 17, 2017

AUGUST 2016 (CHEMICAL REDUCTION STUDY AREA)



Legend

UFMW-02S/I/D

◆ Monitoring Well (Triple Completion)

CTIW-01S Injection Well (Single Completion) E1-2 Extraction Well (Not Associated with Chemical Reduction Study)

M-37 Monitoring Well (Not Associated with Chemical Reduction Study) IWF Extraction Well (Not Associated with Chemical Reduction Study)

1,731.58 Groundwater Elevation (feet amsl)
Groundwater Elevation Contour (feet amsl)

> Flow Direction and Hydraulic Gradient (ft/ft) Shallow Well (Screened in Qal)

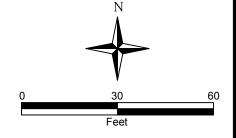
(702) 854-2293

Intermediate Well (Screened in UMCf)
Deep Well (Screened in UMCf) D

Quaternary Alluvium Qal UMCf Upper Muddy Creek Formation

Above Mean Sea Level amsl Feet per Foot

- Only intermediate wells were used to develop intermediate groundwater contours.
- Groundwater elevations shown were measured in August 2016; recent groundwater elevations not depicted because ongoing groundwater extraction and soil flushing activities as part of the AP Area Treatability Study have created conditions that are not as representative of natural groundwater elevations.



Project No:

Date:



IN-SITU CHROMIUM TREATABILITY STUDY

GROUNDWATER CONTOURS AND FLOW DIRECTION - INTERMEDIATE WELLS AUGUST 2016 (CHEMICAL REDUCTION STUDY AREA)

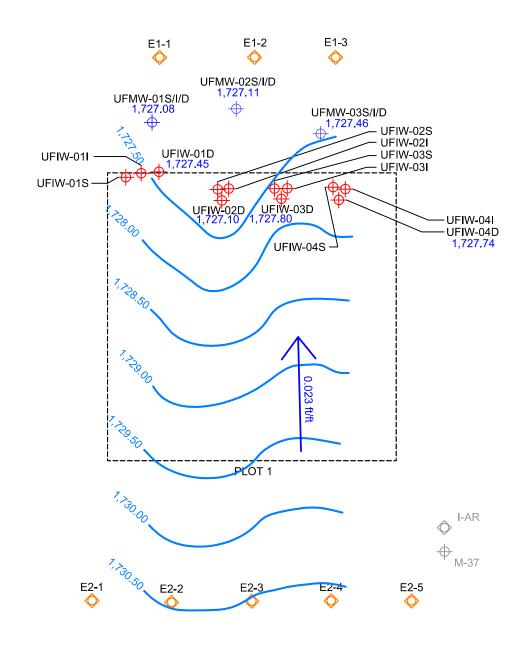
NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

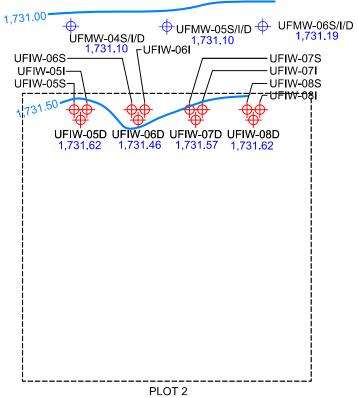
Designed By: Figure No. 6b

87600014

NOVEMBER 17, 2017

www.tetratech.com 150 S. 4th Street, Unit A Henderson, Nevada 89015





Legend

UFMW-02S/I/D

◆ Monitoring Well (Triple Completion)

CTIW-01S Injection Well (Single Completion) E1-2 Extraction Well (Not Associated with Chemical Reduction Study)

M-37- Monitoring Well (Not Associated with Chemical Reduction Study) I-AR IWF Extraction Well (Not Associated with Chemical Reduction Study)

1,731.62 Groundwater Elevation (feet amsl)
Groundwater Elevation Contour (feet amsl)

> Flow Direction and Hydraulic Gradient (ft/ft) Shallow Well (Screened in Qal)

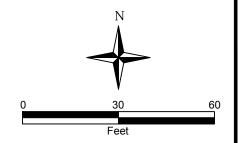
Intermediate Well (Screened in UMCf)
Deep Well (Screened in UMCf) D

Quaternary Alluvium Qal

UMCf Upper Muddy Creek Formation Above Mean Sea Level amsl

Feet per Foot

- Only deep wells were used to develop deep groundwater contours.
- Groundwater elevations shown were measured in August 2016; recent groundwater elevations not depicted because ongoing groundwater extraction and soil flushing activities as part of the AP Area Treatability Study have created conditions that are not representative of natural groundwater elevations.



Project No:

Date:



IN-SITU CHROMIUM TREATABILITY STUDY

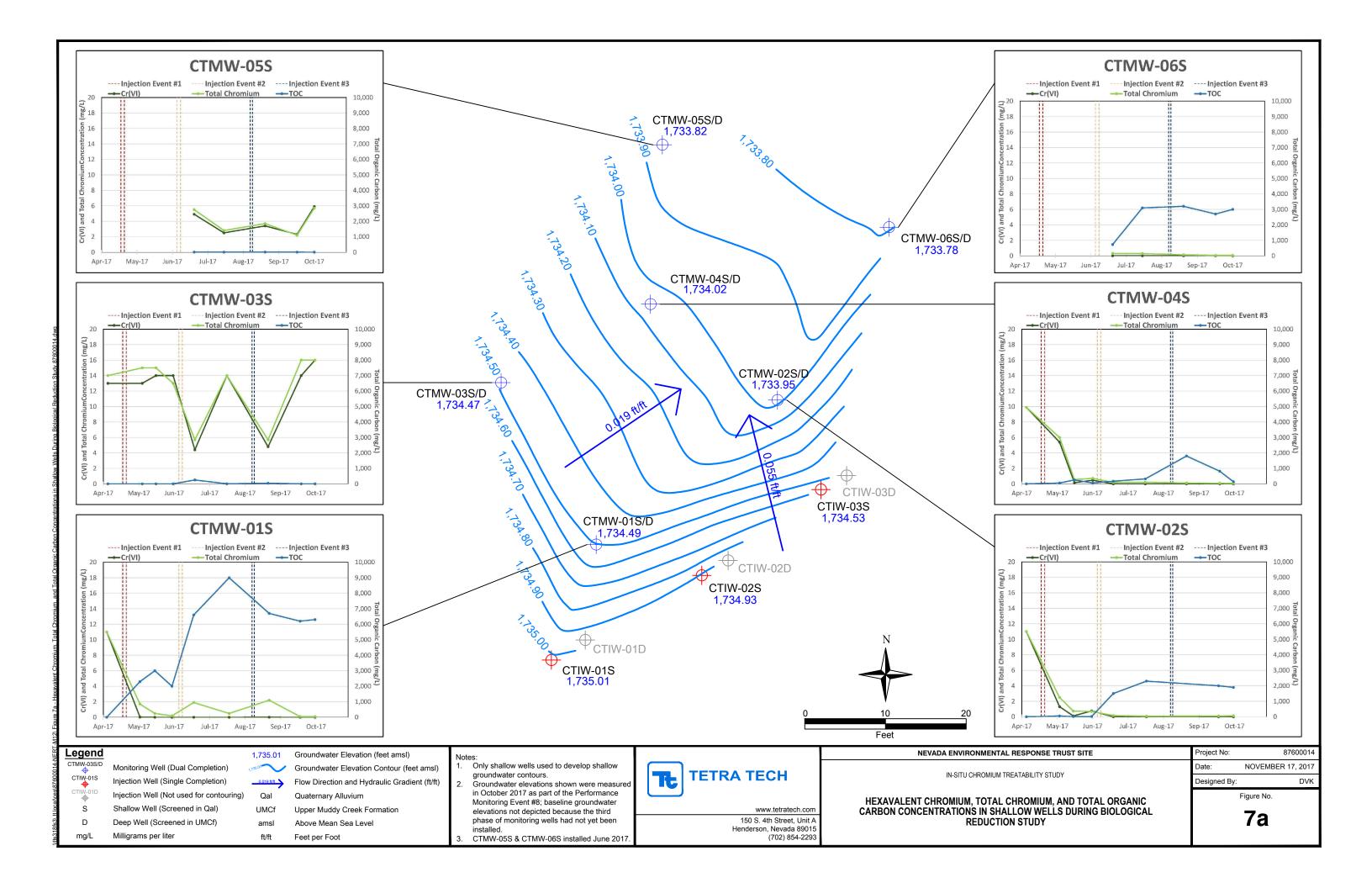
GROUNDWATER CONTOURS AND FLOW DIRECTION - DEEP WELLS AUGUST 2016 (CHEMICAL REDUCTION STUDY AREA)

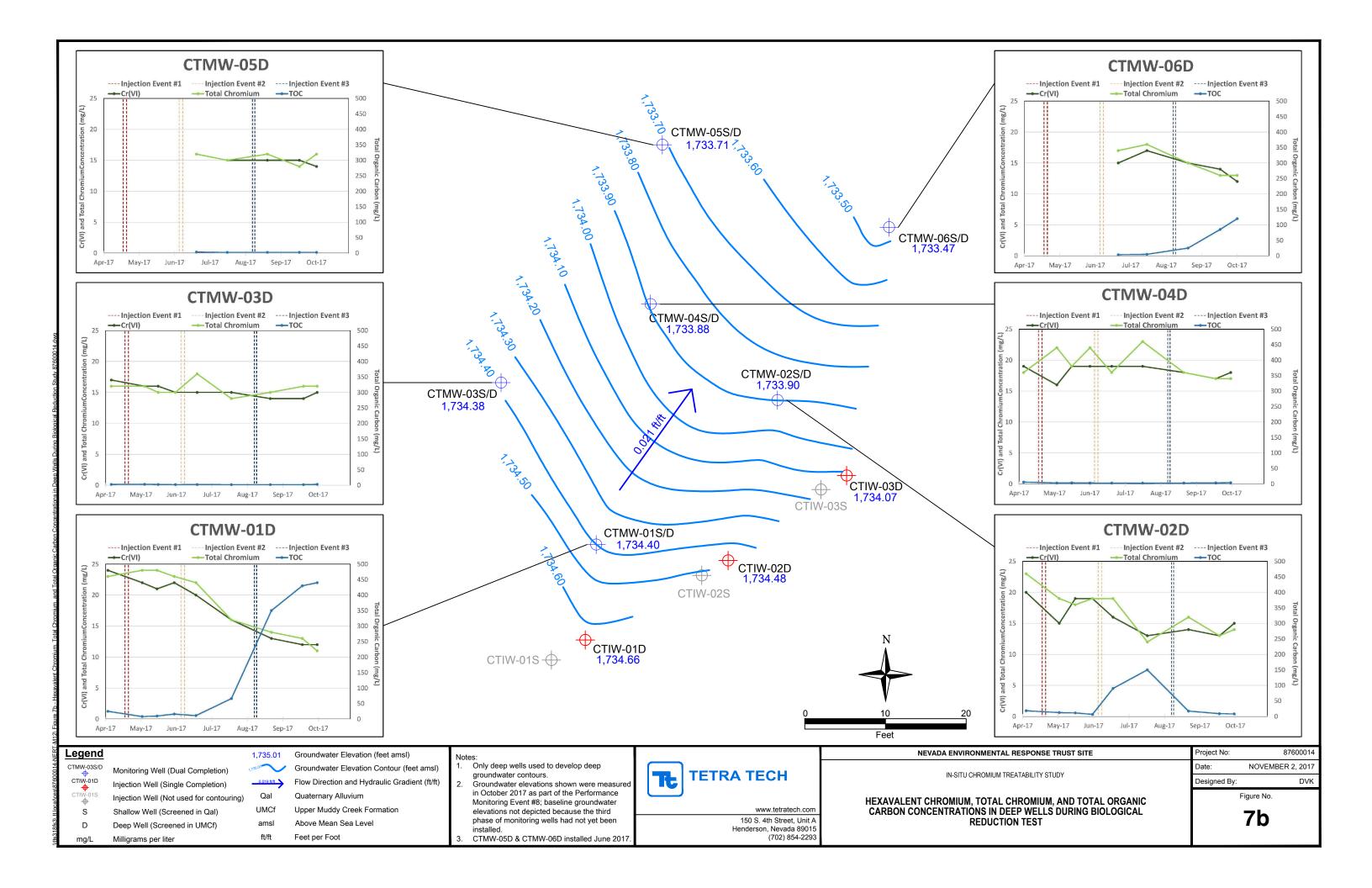
NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

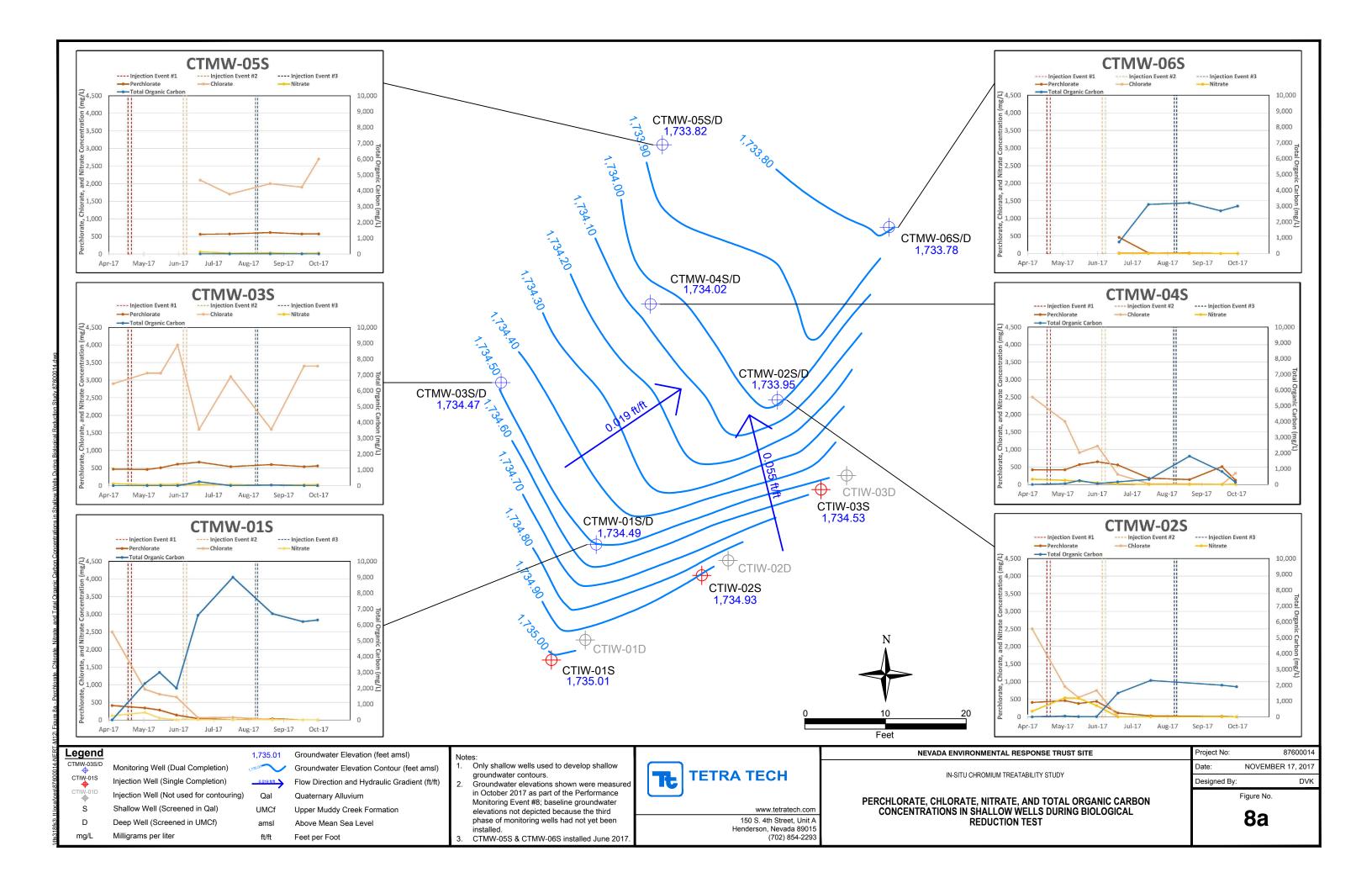
NOVEMBER 17, 2017 Designed By: Figure No. 6c

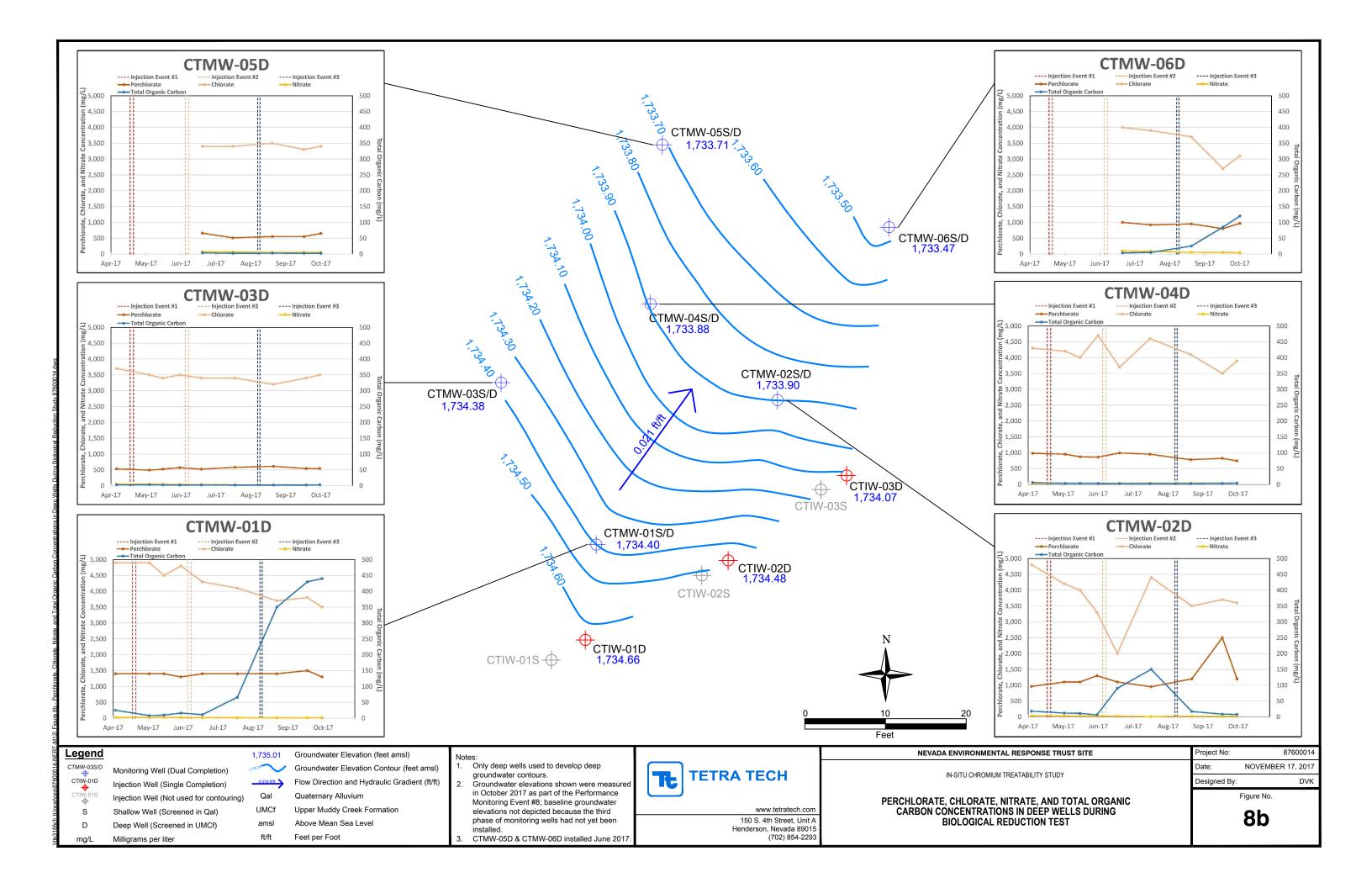
87600014

www.tetratech.com 150 S. 4th Street, Unit A Henderson, Nevada 89015 (702) 854-2293









Appendix A UNLV Bench-Scale Report



FINAL REPORT

Bench-Scale Investigation: Chemical and Biological Reduction of Hexavalent Chromium and Co-Contaminants at the Ammonium Perchlorate (AP) Area of the NERT Site, Henderson, Nevada.

By

PI: Dr. Jacimaria Ramos Batista

Research Associate: Dr. Sichu Shrestha

Department of Civil and Environmental Engineering and Construction, University of Nevada Las Vegas, Phone: 702-895-1585, jaci.batista@unlv.edu

Edited by: Nicole Martin, University of Nevada Las Vegas

Rick Armseth, Tetra Tech

Submitted to:

Arul Ayyaswami and Carl Lenker, Tetra Tech

17885 Von Karman Ave., Suite 500, Irvine, CA 92614-6213 | tetratech.com

Arul.Ayyaswami@tetratech.com, Carl.Lenker@tetratech.com

EXECUTIVE SUMMARY

Background and Objectives

Tetra Tech, on behalf of the Nevada Environment Response Trust (NERT), has proposed to perform pilot testing to evaluate in-situ groundwater remediation of hexavalent Cr (VI) and other co-contaminants (i.e., nitrate, chlorate, and perchlorate) in the AP area of the site. Currently, the contaminated groundwater from this area is treated by a chemical precipitation unit with ferrous sulfate to remove Cr (VI) and fluidized bed reactors (FBRs) to biologically reduce nitrate, chlorate, and perchlorate. To support the field pilot-scale investigation, bench-scale investigations were performed at the University of Nevada Las Vegas (UNLV) to examine chemical and biological reduction of Cr (VI) and biological reduction of the co-contaminants.

The objectives of the bench-scale tests were:

- (1) To evaluate whether calcium polysulfide (CaSx), a reducing agent commonly used in the winery industry, will be effective in chemically reducing Cr (VI) in-situ at the NERT site;
- (2) To compare the removal effectiveness of Cr (VI) with CaSx, with that of ferrous sulfate, the reducing agent currently used at NERT in the ex-situ treatment unit.;
- (3) To investigate the potential for in-situ biological reduction of Cr (VI) and cocontaminants using various types of substrate as electron donors.

This report describes the bench-scale investigations performed at UNLV to support insitu treatment of Cr (VI) and co-contaminants in the AP area of the NERT site.

Experimental Approach

Both batch and column tests were performed and biological and chemical reductions were investigated. The testing used soil and groundwater extracted from the quaternary alluvial (QAL) and the Upper Muddy Creek Formation (UMCf) zones of the AP area of NERT.

Soil and groundwater were obtained from boreholes drilled at the site by Tetra Tech from three depth intervals 23 - 48 feet below ground surface (ft bgs). Soil samples were

collected from wells UFIW-02S (QAL, 23-28 ft bgs) UFIW-02I (intermediate, 31-36 ft bgs), and UFIW-02D (UMCf, 43-48 ft bgs). In addition, soil samples were collected from wells CTMW-03S (QAL, 18 to 23 feet bgs) and CTIW-01D (UMCf, 33 to 38 ft bgs) for the biological reduction tests. Groundwater samples were collected from well UFIW-06S (QAL, 25-30 ft bgs) and well UFIW-06I (UMCf, 35-40 ft bgs). In later tests, groundwater samples were also collected from wells UFIW-03, CTIW-01, and CTMW-03.

Both microcosm and column tests were performed on a composite sample of soil. Composite samples were generated by blending equal volumes of soil from different depths, but from the same well and within the same site designation (QAL or UMCf).

Wet blended soils were used for chemical soil analysis and biological batch microcosm tests. For column testing, soils were sun dried ($105^{\circ}F$) and packed into two-inch diameter columns to mimic the groundwater aquifer with flow velocity and permeability similar to that found in the field.

All microcosm tests were performed using 125 mL borosilicate glass bottles with thirty grams of wet soil and a total of 100 mL of groundwater, nutrients, and desired amount of substrate were added. EOS-Pro emulsified oil, molasses, sugar, and Industrial Sugar Wastewater were used as carbon substrates in biological microcosms and columns. When needed, phosphate and ammonium wer added as nutrients in the form of sodium phosphate or di-ammonium phosphate.

For the biological reduction of Cr (VI) and co-contaminants, four columns were used: two with QAL and two with UMCf soil. The columns were 2 inches in diameter and 50 inches long. Because of the low permeability of the formation in the AP area, the QAL columns were pressurized to 5 psi and the UMCf columns were pressurized at 10 psi. An in-house built pressure valve was used to pressurize the soil columns along with an Aquatec CDP6800 booster pump. Columns were fed with groundwater from CTMW-03S well for QAL and CTMW-03D for UMCf.

Major Findings

Soil Characterization and Groundwater Contaminant Concentrations

The QAL soil samples were visibly granular and dry, while the two lower depth intervals—Intermediate and UMCf—were clayey with very high moisture content. The moisture content in soil samples were 12.01 ± 0.58 % in the QAL and 42.26 ± 3.55 % in UMCf. The sieve analysis shows that the majority of the grains were between 0.425 mm to 0.075 mm (>45%). The second highest percentages were: for QAL particles size between 4.75 and 0.85 mm, (26.44%), and for UMCf particles < 0.075mm (35.70%).

The Cr (VI) concentrations in soils varied from 150 μ g/kg in QAL to 300 μ g/kg in UMCf. Nitrate and perchlorate varied from 70-466 μ g NO3/kg to 47.3 - 530 μ g ClO4 /kg in QAL and UMCf, respectively.

QAL groundwater quality fed to the column on average contained chlorate concentrations of about 3,450 mg/L, perchlorate about 620 mg/L, and Cr (VI) about 16,500 μ g/L. The UMCf groundwater contained higher concentrations of chlorate at about 3,800 mg/L, perchlorate about 840 mg/L, and Cr (VI) about 18,000 μ g/L.

Chemical Reduction of Cr (VI)

Batch precipitation tests with groundwater containing $\sim 10,000~\mu g/L$ Cr (VI) revealed that >99% of Cr (VI) can be removed from QAL and UMCf groundwater using CaSx. All final Cr (VI) concentration were <100 $\mu g/L$. For groundwater from both intervals, a Cr (VI) concentration below 10 $\mu g/L$ was obtained for two times the calculated stoichiometric amount of CaSx. Additional CaSx up to 5 times the stoichiometric amount did not promote higher removals. Similar to CaSx, the use of ferrous sulfate resulted in > 99% removal of Cr (VI). However, at least 5X the stoichiometric amount of ferrous sulfate was needed to achieve comparable results to those of CaSx. In addition, final Cr (VI) levels < 10 μg Cr+6 /L were not achieved with ferrous sulfate. However, lower turbidity groundwater is obtained with the use of ferrous sulfate as compared to CaSx.

CaSx was injected into columns to remove Cr (VI) from both QAL and UMCf groundwater and showed excellent Cr (VI) removal, > 99%. The effluent Cr (VI) concentrations in QAL columns were numerically lower than that of UMCf column. However, there is no statistically significant difference (p> 0.05) between the effluent Cr (VI)

concentrations of both columns during the injection period. Therefore, injection of CaSx can be used at NERT to remove Cr (VI) from both QAL and UMCf groundwater.

Microcosms for Reduction of Cr (VI) and Co-contaminants

For microcosms using QAL soil and groundwater, the results show that all substrates (i.e. EOS-PRO, molasses, and Industrial Sugar Wastewater) can support Cr (VI) reduction. However, Industrial Sugar Wastewater alone or mixed with EOS-PRO promotes faster degradation rates. To reach Cr (VI) concentrations below 100 μ g/L, it took the Industrial Sugar Wastewater substrate 11 days as compared to 19 days for EOS-PRO. All carbon substrates investigated were able to promote Cr (VI) reduction in the QAL from 14,000 μ g/L to < 10 μ g/L within 36 days.

Cr (VI) reduction in the UMCf groundwater could also be achieved using all substrates studied, but the reduction is much slower due to the slow groundwater velocity through the UMCf. On Day 36, Cr (VI) in microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater were below detection limit (10 μ g/L). The degradation was much slower for EOS-PRO microcosms, and only on Day 58 was the Cr (VI) below the detection limit (10 μ g/L). For both QAL and UMCf, the addition of a highly biodegradable substrate, Industrial Sugar Wastewater, promotes faster degradation rates. Cr (VI) reduction rates in the UMCf were slower than that for QAL. Although 10 μ g/L effluent Cr (VI) was obtained within 36 days for UMCf using Industrial Sugar Wastewater and a mixture of EOS-PRO oil and Industrial Sugar Wastewater, it took 58 days for EOS-PRO alone to reach these concentrations.

It is suspected that the reason for the slower degradation in the presence of EOS-PRO alone relates to the slower release of EOS-PRO from the UMCf soil as compared to QAL. Therefore, for UMCf remediation, it is advantageous to supplement with a highly biodegradable substrate. It was also found in this research that the use of Industrial Sugar Wastewater promoted about 40% abiotic reduction of Cr (VI) due to the presence of components in the wastewater that promoted chemical reduction. However, using a highly biodegradable substrate alone is not recommended for overall bioremediation because of the presence of other co-contaminants that will require higher substrate dosages. The

concentrations of the contaminants of concern at the NERT site are very high and therefore the mass of carbon substrate needed for biodegradation is also high. Emulsified oil has a COD of 2,000,000 mg/L as compared to 100,000 mg/L for sugar, a soluble substrate. Therefore, the amount of sugar needed to perform the same remediation work would be 20 times that of emulsified oil.

Nitrate and chlorate biodegradation in the microcosm followed Cr (VI) reduction. In QAL, chlorate degradation was observed on Day 14 (about 75%) in the EOS-PRO microcosms, which was the same day when nitrate degradation was observed. Therefore, there was some concomitant degradation of nitrate and chlorate. The data reveal that EOS-PRO supports chlorate reduction very well, while Industrial Sugar Wastewater does not. Chlorate concentrations stayed relatively unchanged in microcosms that used only Industrial Sugar Wastewater. The opposite was noted for Cr (VI) reduction; while Cr (VI) reduction is supported by all substrates tested, especially by Industrial Sugar Wastewater, the degradation of nitrate and chlorate is better supported by EOS-PRO oil. Chlorate concentration was below detection limit (5 mg/L) on Day 19 in the EOS-PRO microcosms. For the Mix microcosms, chlorate degradation was not observed until after Day 19 and was below the detection limit on Day 26. For Industrial Sugar Wastewater, only about 26% of the chlorate was removed by Day 99.

For the UMCf microcosms, chlorate degradation was observed on Day 36 in the EOS-PRO microcosms (about 39%), which was the same day when nitrate degradation was observed in UMCf microcosms with EOS-PRO. The chlorate concentration was below 5 mg/L for the EOS-PRO microcosms on Day 71. For microcosms using a mixture of EOS-PRO and Industrial Sugar Wastewater, chlorate degradation was not observed until Day 44 and was below the detection limit on Day 82. For Industrial Sugar Wastewater microcosms, only about 8% of the chlorate degraded by Day 99. The lower degradation of chlorate in Industrial Sugar Wastewater suggests that Industrial Sugar Wastewater did not support chlorate degradation as compared to EOS-PRO.

Only very minor perchlorate degradation was observed in any of the microcosms during the 99 days of operation. In the microcosms fed with EOS PRO, a 17-20% decrease was observed after Day 82 for both QAL and UMCf.

Microbiological investigations revealed that the total number of bacteria present in the original soils, before addition to the microcosms, was 2.07E+06 and 1.35E+04, for QAL and UMCf, respectively. Therefore, the QAL soil contained 153 times more bacteria than UMCf. The addition of a carbon substrate, as expected, resulted in significant increase in the number of bacteria present. By Day 18, the number of bacteria increased approximately 230 times and 1,890 times for QAL and UMCf, respectively. However, by Day 102 the amount of bacteria decreased by about 50% for both UMCf and QAL soils. Bacteria diversity showed significant amounts of Pseudomonas (> 70-80%) and Acinetobacter (> 5-20%). In microcosms performed with fresh soil samples, within two weeks of soil collection, Pseudomonas and Acinetobacter persisted throughout the test run. However, microcosm tests performed with samples that had been collected six month earlier showed very different diversity. In these microcosms, with time, the species observed were Clostridium beijerinskii, Corynebacterium, Sporolctobacillus nakayamae, and Rummeliibacillus suwonensis. Many of the bacteria identified from the microcosms are spore forming; they are bacteria that can thrive under unfavorable conditions.

It is important to notice that while Cr (VI), perchlorate, and chlorate concentrations in the QAL and UMCf waters were similar, the nitrate concentration in QAL was approximately three times that of UMCf. This is important because significant chlorate degradation happened only after nitrate was significantly degraded. In the AP area, nitrate degradation is taking up a large percentage of the time required for remediation. In addition, TDS concentrations in the microcosms were approximately 12,000 (1.2%) mg/L in QAL and 10,000 (1%) mg/L in the UMCf microcosms. It is well established that salt concentrations greater than 0.5%, negatively impact perchlorate degradation. Therefore, two factors are contributing for the longer degradation times at the AP area: the high concentration of nitrate and high TDS concentrations.

Biological Reduction of Cr (VI) and Co-contaminants in Columns

QAL and UMCf columns were run for over 147 days with contact times of 8.9-10.6 days to 5.2 -7.2 days, respectively. When comparing the performance of the QAL and UMCf

for Cr (VI) removal, the QAL columns did better, reaching non-detect levels (< $10~\mu g/L$) after Day 45 of operation. The UMCf columns, fed the same COD equivalent of 8,000 mg/L, reached stable non-detect by Day 90. This observation may reflect the fact that contact times in the UMCf columns were 5.2-7.2 days, as compared to 8.9 to 10.6 days for QAL. Considering the QAL contact time was roughly twice as long, better degradation performance was expected. However, in the field, UMCf contact times will be longer and better performance is expected than for QAL under the same substrate feed conditions.

The results revealed that nitrate degradation is impacted by the presence of Cr (VI); Cr (VI) degradation is observed to occur first, however, when Cr (VI) levels decrease, nitrate and Cr (VI) are reduced simultaneously. For the QAL columns, complete nitrate degradation lagged about 5 days behind Cr (VI) reduction (Day 14 for Cr (VI) and Day 19 for nitrate). Similar to that observed for Cr (VI), nitrate levels increase when substrate levels decrease.

As observed for QAL, the UMCf data indicate that nitrate and Cr (VI) reduction occur at the same time. However, the level of nitrate reduction for the UMCf columns was less than that observed for QAL. In the QAL columns, nitrate reduction to < 1 mg/L was observed when Cr (VI) concentrations were below detection; for the UMCf columns, the lowest nitrate obtained was 50 mg/L. Again, this difference is due to the shorter contact time (5.2 to 7.2 days) in the UMCf columns as compared to that in the QAL columns (8.9 to 10.6 days). In the field, UMCf contact times will be much greater than the ones that were feasible to simulate in the laboratory.

In QAL, chlorate degradation was observed by Day 24, after Cr (VI) was non-detect and nitrate levels were about 2 mg/L as NO3 in both columns. Therefore, chlorate will degrade after nitrate and Cr (VI) have been utilized. The impact of nitrate on chlorate degradation was observed on Day 64 when the nitrate was less than 2 mg/L as NO3 in Column A, and Column B, a replicate column, had about 17 mg/L as NO3. The effluent chlorate in Column A was half of the chlorate in Column B (about 500 mg/L). After Day 127, no chlorate was observed in the QAL columns, which correlates to the period where both Cr (VI) and nitrate had also reduced.

On Day 113, chlorate was observed at half of its initial influent concentration (i.e., 3000 mg/L) in UMCf column A. Chlorate was completely biodegraded in Column A on Day 137 and on Day 151 in UMCf column B. For the UMCf columns, chlorate was biodegraded to non-detectable levels after Day 151 and after Cr (VI) and nitrate had been reduced.

No perchlorate degradation was observed until Day 101 in QAL columns. On Day 115, the perchlorate concentration was half the initial concentration in both columns. Recall that chlorate had degraded about 50% by Day 68 and it was completely degraded in Day 127. Therefore, the degradation of perchlorate observed in Day 101 follows chlorate degradation. No perchlorate degradation was observed until Day 165 in UMCf columns.

The microcosm and column tests demonstrated that in-situ bioremediation of Cr (VI) and co-contaminants at the AP area is possible. Cr (VI) degradation occurs relatively fast. However, the high nitrate concentrations in the area cause delay of chlorate and perchlorate degradation. The timeline and sequence of degradation for the contaminants of concern is illustrated below for the QAL and UMCf columns. Notice that in QAL, Cr (VI) is reduced in about a week and nitrate degrades in about a month. However, three times more time is needed to degrade chlorate; perchlorate degradation follows quickly after chlorate degrades. For UMCf, it took longer to degrade all the contaminants, especially nitrate which took 123 days to biodegrade.

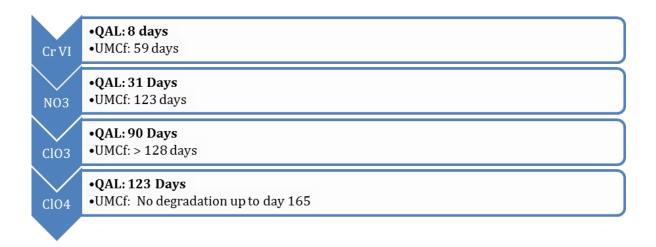


TABLE OF CONTENT

EXECUTIVE SUMMARY i
Background and Objectivesi
Experimental Approachi
Major Findingsii
TABLE OF CONTENTix
LISTS OF FIGURESxiv
LISTS OF TABLESxxii
CHAPTER 1 BACKGROUND AND OVERALL OBJECTIVES OF CHROMIUM REMOVAL INVESTIGATIONS
1.1 Objectives of Bench-Scale Remediation Testing2
CHAPTER 2 METHODOLOGY3
2.1 Soil and Groundwater Sample Collection from the NERT Site and Blending3
2.2 Analysis of Soil and Groundwater Samples4
2.2.1 Characterization of Soil Samples4
2.2.2 Characterization of Groundwater Samples5
2.3 Analytical Methods Used for Chemical Characterization of Soil and Groundwater6
2.4 Batch Chemical Reduction Tests for Chromium7
2.4.1 Groundwater Used for Batch Testing7
2.4.2 Preliminary Batch Testing for Cr (VI) Reduction in Groundwater at High and Low Concentration Using CaSx and FeSO ₄ 8
2.4.3 Secondary Batch Testing for Cr (VI) Reduction at High and Low Concentration Using CaSx and FeSO ₄ 9
2.5 Column Testing for Cr (VI) Removal Using Calcium Polysulfide11

2.5.1 Preliminary Column Testing	11
2.5.2 Secondary Column Testing for Cr (VI) Reduction in Groundwater at H	igh and Low
Concentration Using CaSx	12
2.6 Batch Test for Biological Reduction	15
2.6.1 Phase I Microcosms for Biodegradation of Chromium, Perchlorate, using EOS-PRO, Industrial Sugar Wastewater, a Mixture of EOS-PRO an Sugar Wastewater, and Molasses as Substrate	d Industria
2.6.2 Phase II Microcosms with EOS-PRO and Industrial Sugar Wastewater	
(at 3 parts EOS-PRO: 12 parts Industrial Sugar Wastewater Ratio) and ammonium Phosphate	
2.6.3 Microcosms with Sugar as Substrate to Substitute for Industrial Sugar	
2.7 Column Test for Biological Reduction	
2.8 Microbial Analysis	25
CHAPTER 3 SOIL AND GROUNDWATER CHARACTERIZATION	26
3.1 Soil Characterization	26
3.1.1 Grain Size Distribution of Soil	27
3.1.2 Contaminant in the Groundwater Extracted from the Soil Samples Extraction)	•
3.2 Contaminant Extraction by Soil Rinsing	27
3.2.1 Contaminant Extraction by Soil Rinsing for Soil from Well UFIW-02	27
3.2.2 Contaminant Contribution by the Soil Samples in Soil Fractions (Rinse	ed-soil) 28
3.2.3 Contaminant Extraction by Soil Rinsing for Soil from Wells CTMW-03	
3.3 Groundwater Characterization	35

4.1. Batch Testing for Chemical Reduction of Cr (VI)	49
4.1.1 High Chromium Concentration Test	49
4.1.2 Effect of Solids in Groundwater	53
4.1.3 Low Chromium Concentration Test	56
4.2 Chemical Coagulation Using Columns	59
4.2.1 Low Concentration Column Test	61
4.2.2 High Concentration Column Test	65
4.2.3 Total Dissolved Chromium Measured Using ICP for Low and High Conce	entration
Columns	67
4.2.4 CaSx Utilization	70
4.2.5 Metallic Scanning for Low and High Concentration Columns	71
CHAPTER 5 RESULTS AND DISCUSSIONS OF BIOLOGICAL REDUCTION	76
5.1 Batch Biological Test	76
5.1.1 Phase I Batch Microcosm Testing using EOS-PRO, Industrial Sugar Wa	stewater
(ISW), a Mixture of EOS-PRO and ISW, and Molasses as Substrate	76
5.1.2 Phase II Microcosms with a Mixture of EOS-PRO and Industrial Sugar Wa	
as Substrate (3 parts of EOS-PRO and 12 parts of Industrial Sugar Wastewater) Di-ammonium Phosphate	
5.1.3 Microcosms with a Mixture of EOS-PRO and Sugar as Substrate to Substitute Industrial Sugar Wastewater	
5.2 Column Biological Test	
5.2.1 COD Measurements	
5.2.2 Cr (VI) Reduction	
5.2.3 Dissolved Chromium Measurements	
5.2.4 Nitrate Concentrations	142

5.2.5 Chlorate Concentrations	149
5.2.6 Perchlorate Reduction	150
5.2.7 Overall Degredation Timelines	152
5.2.8 Phosphate Concentrations	153
6. References	156
APPENDICES	158
Appendix A: Investigation of analytical interference with Cr (VI) groundwater	_
A.1 Issues with Measuring Low Cr (VI) Concentration QAL Groundwater	158
Appendix B: Preliminary Batch Testing	162
B.1 Preliminary Batch Testing Matrix for Cr (VI) Removal from QAL and Groundwater	
B.2 Preliminary Batch Test Result for High Concentration of Chromium	163
B.3 Preliminary Batch Coagulation Test Using Low Cr Concentration	164
Appendix C: Final Test Matrix for CaSx and Ferrous Sulfate Coagulation	167
C.1 Matrices for Final Batch Testing with QAL and UMCf Groundwater	167
C.2 Data for Final Batch Testing with QAL and UMCf Groundwater	168
Appendix D: Preliminary Testing of Chromium Removal Using Columns	170
Figure D.1: Schematic diagram of the preliminary columns to remove chromium	with 171
Appendix E: Substrate Calculation	178
E.1: Calculation of Substrate Requirement	178
E.2: Matrices Used for the Study	180
E.3: Testing Impact of Chemical Reduction of Cr (VI) by Industrial Sugar Wastewa	ater182
Appendix F: Pictures of the Chemical Coagulation Tests for Cr Removal w	ith CaSx
and Ferrous Sulfate	184

Appendix G: Raw Data for Microbial Numbers and Diversity in the Microco	sms 195
F.2 Column Coagulation Tests	190
F.1: Batch Coagulation Tests	184

LISTS OF FIGURES

Figure 2.1 Experimental setup used in the batch tests for chromium precipitation with
CaSx and FeSO ₄
Figure 2.2: Schematic diagram of columns for chemical precipitation of chromium in columns using calcium polysulfide. The horizontal arrows at 27 inches from the bottom of the column indicate the injection port for calcium polysulfide
Figure 2.3: Microcosms with EOS-PRO and Industrial Sugar Wastewater as substrate at (3 parts of EOS-PRO: 12 parts of Industrial Sugar Waste) ratio and with di ammonium phosphate
Figure 2.4: Schematic diagram of columns used for biological treatment of the UMCf and QAL contaminated groundwater (Day 1 to Day 28)23
Figure 2.5: Schematic diagram of columns used for biological treatment of the QAL and UMCf groundwater after Day 28. The QAL columns were pressurized at 5 ps and UMCf was 10 psi. The QAL columns before Day 28 were gravity fed24
Figure 3.1: Groundwater characterization in quaternary alluvial layer (25-30 ft) (a) muddy creek formation (35-40 ft) (b) groundwater from UFIW-06 received on 7/22/2016 and comparison of QAL and UMCf groundwater (c). The contaminants concentrations for the filled and with forward hatched bars (left of the vertical dotted line) are read on the left y-axis and for the filled and with backward hatched bars (right of the vertical dotted line) are read on the right y-axis.
Figure 3.2: Hexavalent chromium, COD and Turbidity varied in each groundwater sample from UFIW-06 received on 7/22/2016 from both depths38
Figure 3.3: Total metal analysis in the groundwater sample from UFIW-06 received or 7/22/201642

Figure 3.4: Groundwater from UFIW-03 received on 8/26/2016 for characterization in quaternary alluvial layer, QAL (25-30 ft) (a), muddy creek formation, UMCf
(35-40 ft) (b), and comparison between QAL and UMCf (c)44
Figure 3.5: Groundwater from UFIW-03 received on 11/22/2016 for characterization in quaternary alluvial layer, QAL (25-30 ft) (a), muddy creek formation, UMCf (35-40 ft) (b), and comparison between QAL and UMCf (c)46
Figure 3.6: Characteristics of mixed QAL (CTMW 03 well) and UMCf (CTIW 01D) groundwater
Figure 3.7: Groundwater from well CTIW 01D, CTIW 01S, CTMW 03, and CTMW 03D analysis obtained from Tetratech48
Figure 4.1: Effluent Cr (VI) concentrations in grab samples in the QAL A column after chemical precipitation of chromium with calcium polysulfide. (Calcium polysulfide was stopped on Day 31-represented by an arrow). The average influent hexavalent chromium concentration was 1,163 \pm 121 µg/L (Days 1 to 36) and 1,183 \pm 163 µg/L (Days 37 to 51), and percent removal was 94 \pm 8% in the column during the injection period. The influent concentration was increased on Day 37 to 10000 µg/L
Figure 4.2: Effluent Cr (VI) concentrations in grab samples in the UMCf A column after chemical precipitation of chromium with calcium polysulfide. (Calcium polysulfide was stopped on Day 18 represented by an arrow). The average influent hexavalent chromium concentration was $876\pm171~\mu g/L$ (Days 1 to 29) and $907\pm139~\mu g/L$ (Days 30 to 53), and percent removal was $86\pm8\%$ in the column during the injection period. The influent concentration was increased on Day 30
Figure 4.3: Comparision of effluent Cr (VI) concentrations in grab samples in the the QAL and UMCf A column during the injection of calcium polysulfide. (The days when the calcium polysulfide stopped are represented by arrows). The

average influent hexavalent chromium concentration was 1163± 121 μg/L	
QAL and 876± 171 μg/L in UMCf.	
Figure 4.4: Effluent Cr (VI) concentrations in the UMCf B after chemical precipitation	
chromium with calcium polysulfide. (CaSx was stopped on Day	
represented by an arrow). The average influent Cr (VI) concentration w	
9639± 465 µg/L and percent removal of 93±22% in the column during t injection period	
Figure 4.5: Total dissolved chromium concentrations measured in settled, but unfilter composite samples in the QAL column throughout the study period. T	
vertical arrow indicates the day when the CaSx injection was stopped	
Figure 4.6: Total dissolved chromium concentrations measured in settled, but unfilter	·ed
composite samples in the UMCf A column throughout the study period. T	'hε
vertical arrow indicates the day when the calcium polysulfide injection w	7as
stopped for each column	69
Figure 4.7: Dissolved chromium concentrations measured in settled, but unfilter	·ed
composite samples in the UMCf B columns throughout the study period. T	'nε
vertical arrow indicates the day when the calcium polysulfide injection w	/as
stopped for each column	70
Figure 4.8: Total metal concentrations in the QAL in $\mu g/L$ (a) mg/L (b)	72
Figure 4.9: Total metal concentrations in the UMCf A in μg/L (a) mg/L (b)	73
Figure 4.10: Total metal concentrations in the UMCf B in μ g/L (a) mg/L (b)	75
Figure 5.1: COD concentration in filtered samples in QAL (a) and UMCf ((b)
microcosms	78
Figure 5.2: COD concentration in filtered samples in QAL and UMCf using Molasses w	ith
phosphate as substrate	79
Figure 5.3: COD in QAL and UMCf control microcosm: blank (a), Industrial Sug	gar
Wastewater without phosphate (b), and Molasses without phosphate (c),	81

Figure 5.4: Cr (VI) in QAL (a) and UMCf (b) microcosms with EOS-PRO, Mix, and Industry	
Sugar Wastewater as substrate	83
Figure 5.5: Cr (VI) in microcosms with Molasses as substrate with phosphate	85
Figure 5.6: Cr (VI) in QAL and UMCf control microcosm- blank (a), Industrial Sug Wastewater without phosphate (b), and Molasses without phosphate (c)	
Figure 5.7: Nitrate concentration in QAL (a) and UMCf (b) microcosms with EOS-PRO, M and Industrial Sugar Wastewater as substrate	
Figure 5.8: Nitrate concentration measured by IC for QAL and UMCf microcosms with phosphate as substrate	
Figure 5.9: Nitrate concentrations in control microcosms: blank (a), Industrial Sug Wastewater without phosphate (b), and Molasses without phosphate (c)	
Figure 5.10: Concentration of chlorate in QAL (a) and UMCf (b) microcosms with EOS-PR Mix, and Industrial Sugar Wastewater as substrate	
Figure 5.11: Chlorate concentration in QAL and UMCf microcosms with Molasses substrate	
Figure 5.12: Perchlorate concentration in QAL (a), and UMCf (b) microcosms	96
Figure 5.13: Perchlorate concentration in Molasses in QAL and UMCf microcosms	97
Figure 5.14: Phosphate concentration in the QAL (a) and UMCf (b) microcosms	98
Figure 5.15: Total dissolved solids in QAL (a) and UMCf (b) microcosms10	00
Figure 5.16: pH in QAL (a) and UMCf (b) microcosms10	01
Figure 5.17: Microbial diversity for MIX microcosms for QAL (a) and UMCf (b) microcosm	
Figure 5.18: Microbial diversity for MIX microcosms in QAL using known primer f	or
chromium reducing bacteria10	05
Figure 5.19: Microbial diversity for EOS-PRO microcosms for QAL10	06

Figure 5.20:	Cr (VI) concentrations in QAL and UMCf microcosms with a mixture of EOS-
	PRO and Industrial Sugar Wastewater as substrate107
Figure 5.21:	\ensuremath{COD} in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial
	Sugar Wastewater as substrate108
Figure 5.22:	Nitrate concentration in QAL and UMCf microcosms with a mixture of EOS-
	PRO and Industrial Sugar Wastewater as substrate109
Figure 5.23:	Chlorate concentration in QAL and UMCf microcosms with a mixture of EOS-
	PRO and Industrial Sugar Wastewater as substrate110
Figure 5.24	Perchlorate concentration in QAL and UMCf microcosms with a mixture of
	EOS-PRO and Industrial Sugar Wastewater as substrate111
Figure 5.25:	pH in the microcosms112
Figure 5.26:	TDS in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial
	Sugar Wastewater as substrate113
Figure 5.27:	Microbial diversity for MIX microcosms for QAL (a) and UMCf (b) microcosms.
Figure 5.28:	COD in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar as
	substrate119
Figure 5.29:	Cr (VI) in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar as
	substrate119
Figure 5.30:	Nitrate in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar
	as substrate120
Figure 5.31:	COD in the QAL columns- a high amount of substrate (mixture of Industrial
	Sugar Wastewater at 7% and EOS-PRO at 2% by volume) with $45880~\text{mg/L}$
	COD eq, no substrate and EOS-PRO alone at 0.2% (4000 mg/L COD eq) and $$
	0.4% (8000 mg/L COD eq) (a) and a low amount of substrate (mixture of
	Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) with 9260 mg/L $$
	COD eq (b). The average influent hexavalent chromium concentration in the

columns were 14261 \pm 1987 $\mu g/L$ (a) and 12377 \pm 997 $\mu g/L$ (b) over the
operation periods. (The horizontal lines are drawn to clarify the 200 mg/L
and 400 mg/L COD levels)127
Figure 5.32: Effluent COD in the UMCf columns fed with a high amount of substrate
(mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2% by
volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at 0.2%
(4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low amount of
substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at
0.4%) with 9260 mg/L COD eq (b). The average influent hexavalent
chromium concentration was 17385± 1829 $\mu g/L$ (a) and 15360 ±1325 $\mu g/L$
(b) over the operation periods129
Figure 5.33: Effluent Cr (VI) concentrations in the QAL columns- a high amount of
substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2%
by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at
0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low
amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and
EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent
hexavalent chromium concentration in the columns were 14261 \pm 1987 $\mu g/L$
(a) and 12377 ±997 μ g/L (b) over the operation periods134
Figure 5.34: Effluent Cr (VI) concentrations in the UMCf columns fed with: a high amount
of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at
2% by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at
0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low
amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and
EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent
hexavalent chromium concentration was 17385± 1829 $\mu g/L$ (a) and 15360
$\pm 1325~\mu g/L$ (b) over the operation periods
Figure 5.35: Total dissolved Chromium in the OAL columns fed with - a high amount of

substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at

	2%), no substrate and EOS-PRO alone at 0.2% and 0.4% (a) and a low amount	ıt
	of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO	at
	0.4%) (b)	0
Figure 5.36	: Dissolved chromium concentrations in the UMCf columns fed with- a hig	h
	amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS	3-
	PRO at 2%), no substrate and EOS-PRO alone at 0.2% and 0.4% (a) and a lo	W
	amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and	d
	EOS-PRO at 0.4%) (b)14	2
Figure 5.37	: Effluent nitrate concentrations in the QAL14	٠5
Figure 5.38	: Effluent nitrate concentrations in the UMCf14	8
Figure 5.39	: Effluent chlorate concentrations in the QAL14	.9
Figure 5.40	: Effluent chlorate concentrations in the UMCf15	0
Figure 5.41	: Effluent perchlorate concentrations in the QAL15	1
Figure 5.42	: Effluent perchlorate concentrations in the UMCf15	2
Figure 5.43	: Timeline for degradation of contaminant in the columns15	3
Figure 5.44	: Effluent phosphate concentrations in the QAL15	4
Figure 5.45	: Effluent phosphate concentrations in the UMCf15	5
Figure D.1:	Schematic diagram of the preliminary columns to remove chromium with CaS	ίX
		1
Figure D.2:	Effluent Cr (VI) concentrations in the QAL and the UMCf column after chemic	al
	precipitation of chromium with calcium polysulfide. The indent in the pictur	e
	shows chromium concentration in composite samples in days 1 to 3. (Calcium	n
	polysulfide was stopped on Day 23 represented by an arrow). The average	e,
	influent hexavalent chromium concentration was 980±0.01 mg/L and 96	0
	$\pm 0.5~\mu g/L$ in QAL and UMCf, respectively. CaSx was fed continuously in QA	L
	column and was injected each day in HMCf column 17	2

Figure D.3: Effluent dissolved chromium concentrations in the QAL and the UMCf colum
after chemical precipitation of chromium with calcium polysulfide from Da
4. The indent in the picture shows chromium concentration in composit
samples in days 1 to 3. (Calcium polysulfide was stopped on Day 2
represented by the vertical arrow). Note that in columns, most of th
precipitate was trapped by the soil media resulting in lower value of total
chromium after sample filtration17
Figure D.4: Scanning of trace and major results in effluent in the QAL (a and b) and the UMCf (c and d) columns at different days
Figure F.1: High-range concentration batch experimental set-up: (a) groundwater wit ferrous sulfate and (b) with calcium polysulfide18
Figure F.2: High-range concentration settling: (a) groundwater with ferrous sulfate an (b) with calcium polysulfide18
Figure F.3: Low-range concentration batch experimental set-up for QAL groundwater (2 -30 feet bgs) (a) groundwater with ferrous sulfate and (b) with calciur polysulfide
Figure F.4: Low-range concentration settling for QAL groundwater (25-30 feet bgs): (a groundwater with ferrous sulfate and (b) with calcium polysulfide. Each se shows the sludge of individual tests
Figure F.5: Sludge content for low-range concentration for QAL groundwater 25 to 30 fee bgs) with 0.50 mg/L Cr (VI): (a) groundwater with ferrous sulfate and (b) wit calcium polysulfide
Figure F.6: Stirrers after operating batch precipitation test with groundwater from 25-3 ft containing high-range chromium concentration: (a) ferrous sulfate or (b)
with calcium polysulfide showing that no inorganic scales were formed on th
stirrer19
Figure F.7: Injection port on UMCf column Day 119
Figure F.8: Injection port on UMCf column Day 1619

Figure F.9: Injection port on QAL column Day 5 shows the white scale formation at the injection port191
Figure F.10: Injection port on QAL column Day 16 shows the white scale formation at the injection port192
Figure F.11: Set-up of the Final columns for Cr Treatment with CaSX193
Figure F.12: Injection port showing with gravel and glass beads194
LISTS OF TABLES
Table 2.1: Analytical Procedures Used in the Study6
Table 2.2: NPDES limit for chromium (Cr (VI) and total) and corresponding target removals (%) in groundwater with low and high concentrations of chromium
Table 2.3: Matrix Used for Cr (VI) Removal Using CaSx and FeSO410
Table 2.4: Operation of Chemical Precipitation Columns14
Table 2.5: Summary Table with Well ID of Soil and Groundwater16
Table 2.6: Parameters of the Soil Used in the Biological Columns21
Table 2.7: Operation Details for QAL and UMCf columns Used to Investigate Biologica Reduction of Chromium and Co-contaminants
Table 3.1 Grain Size Distribution and Contaminant Contribution from the Soil Samples at QAL (23-28 feet), Intermediate (31-36 feet), and UMCf (43-48 feet) depth26
Table 3.2: Amount of contaminants of concern in the soil at different depths27
Table 3.3: Average amount of contaminants of concern in the soil at different depths34
Table 3.4: Amount of contaminants of concern in the soil
Table 4.1: Batch Precipitation Test for High Chromium Concentration in 250 mI groundwater using various stoichiometric ratios of calcium polysulfide (CaSx) (27% by wt)
() (

Table 4.2: Batch Precipitation Test for High Chromium Concentration in 250 mL
groundwater using various stoichiometric ratios of ferrous sulfate (6%)52
Table 4.3: Batch Precipitation Test for High Chromium Concentration in 250 mL groundwater from 25-30 ft (initial concentration= 10500 μg Cr ⁺⁶ /L) using
various stoichiometric ratios of calcium polysulfide (CaSx, 27%) to Evaluate
the Effect of Solids on Chromium Removal54
Table 4.4: Batch Precipitation Test for High Chromium Concentration in 250 mL
groundwater from 35-40 ft(initial concentration= 9800 µg Cr ⁺⁶ /L) using
various stoichiometric ratios of Ferrous Sulfate (6%) to Evaluate the Effect of
Solids on Chromium Removal55
Table 4.5: Batch Precipitation Test for Low Chromium Concentration in 500 mL groundwater using various stoichiometric ratios of calcium polysulfide (CaSx) (27% by wt)
Table 4.6: Batch Precipitation Test for Low Chromium Concentration in 500 mL groundwater using various stoichiometric ratios of ferrous sulfate (6%)58
Table 4.7: Statistical analysis of percent Cr removal in the columns for composite and grab samples60
Table 4.8: Effluent concentration distribution for QAL, UMCf A, and UMCf B columns60
Table 4.9: Mass calculation of Cr (VI) in the influent and CaSx injected in the columns70
Table 5.1: Microbial Numbers and Diversity for the Phase I Microcosms Using Universal
Table 5.2: Microbial Numbers and Diversity for the Phase I QAL Microcosms using Primer Specific for Chromium Reducing Bacteria103
Table 5.3: Microbial Numbers and Diversity for the Phase II QAL Microcosms Using Universal Primer115
Table 5.4: Microbial Numbers and Diversity for the Phase II QAL Microcosms using Primer
Specific for Chromium Reducing Bacteria115

Table 5.6: Contact times (days) for the groundwater in the QAL and UMCf columns	Table 5.5: Concentrations of nitrate, perchlorate, chlorate and phosphate in the microcosms with EOS-PRO and sugar (4:16)
to 500, 1000, 2000, 3000, 4000, 5000, and 10000 µg Cr+6/L	Table 5.6: Contact times (days) for the groundwater in the QAL and UMCf columns 12
Cr+6/L	-
Table A.4: Chromium Test in Diluted QAL Groundwater spiked with 500 μg Cr+6/L 161 Table B.1: Matrix for the Preliminary Testing with High and Low Concentrations of Cr (VI)	•
Table B.1: Matrix for the Preliminary Testing with High and Low Concentrations of Cr (VI)	
Table B.2: Preliminary Batch Precipitation Test Results Groundwater with High Chromium Concentration (10200 μg/L)	Table A.4: Chromium Test in Diluted QAL Groundwater spiked with 500 μ g Cr+6/L 16
Concentration (10200 µg/L)	
groundwater	
Chromium Concentration with CaSx and FeSO4	
Table C.2: Matrix for QAL and UMCf with filtered groundwater and addition of soil167 Table C3: pH in Batch Tests with High Cr (VI) concentrations in QAL and UMCf Groundwater (Initial Concentration= 10500 μg Cr+6/L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)	
Table C3: pH in Batch Tests with High Cr (VI) concentrations in QAL and UMC Groundwater (Initial Concentration= 10500 μg Cr+6/L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)	Table C.1: Matrix for QAL and UMCf for High and Low Concentrations of Cr (VI)16
Groundwater (Initial Concentration= 10500 μg Cr+6/L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)168 Table C.4: pH in Batch Tests with High Cr (VI) in QAL and UMCf Groundwater to Evaluate	Table C.2: Matrix for QAL and UMCf with filtered groundwater and addition of soil 16
	Groundwater (Initial Concentration= 10500 μg Cr+6/L) Using Calciu
	Table C.4: pH in Batch Tests with High Cr (VI) in QAL and UMCf Groundwater to Evalua the Effect of Solids addition on Chromium Removal

Table C.5: pH in Batch Test with Low Cr (VI) Concentration in QAL Groundwater (Initia
Concentration= 500 μ g Cr ⁺⁶ /L) Using Calcium Polysulfide (CaSx, 27%) and
Ferrous Sulfate (6%)168
Table C.6: Turbidity (NTUs) in Samples with Low Cr (VI) concentrations in QAI Groundwater (Initial Concentration= 500 μg Cr ⁺⁶ /L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)169
Table C.7: Nitrate (mg NO ₃ /L) in the Batch Tests with High Cr (VI) Concentrations in QAI and UMCf Groundwater (Initial Concentration= 10500 μg Cr ⁺⁶ /L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)169
Table C.8: Perchlorate (mg/L) in the Samples for High Cr (VI) in QAL and UMC Groundwater (Initial Concentration= 10500 μg Cr ⁺⁶ /L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)169
Table D.1: Hydraulic properties of the columns172
Table D.2: Statistical analysis of percent removal in the columns for composite and grab
samples174
Table E.1: Amount of contaminants in groundwater178
Table E.2: COD of the substrate178
Table E.3: Substrate requirement calculation for Molasses, Industrial Sugar Wastewater and Sugar178
Table E.4: EOS-PRO requirement calculation179
Table E.5: Matrix for preliminary microcosms (the amount added as mL per L GW is shown in parenthesis)180
Table E.6: Matrix for microcosms with mixture of EOS-PRO and Industrial Sugar Wastewater (the amount added as mL per L GW is shown in parenthesis)
Table E.7: Matrix for microcosms with mixture of EOS-PRO and Sugar (the amount added as mL per L GW is shown in parenthesis)181

Table E.8: Impact of Industrial Sugar Wastewater on Cr (VI)	183
Table G1: Microbial Data of the Phase 1 Microcosms (Preliminary)	195
Table G2: Microbial Data of the Phase 2 Microcosms (3-12)	201

CHAPTER 1 BACKGROUND AND OVERALL OBJECTIVES OF CHROMIUM REMOVAL INVESTIGATIONS

Tetra Tech, on behalf of the Nevada Environment Response Trust (NERT), has proposed to perform pilot testing to evaluate in-situ groundwater remediation of chromium at the NERT site in Henderson, Nevada. The site is contaminated with hexavalent chromium (Cr (VI)) and other co-contaminants (i.e nitrate, chlorate, and perchlorate). Prior to pilot scale testing, a bench-scale investigation was performed at the University of Nevada Las Vegas (UNLV) to support in-situ chemical and biological reduction of Cr (VI) at the site. Both batch and column tests were performed and both biological and chemical chromium reductions were investigated.

Currently, chromium-impacted groundwater at NERT is treated in the Groundwater Extraction and Treatment System (GWETS). GWETS includes two major treatment units, a chemical precipitation unit with ferrous sulfate to remove chromium and fluidized bed reactors (FBRs) to biologically reduce perchlorate, chlorate, and nitrate. The effluent from the chemical precipitation unit is discharged into an equalization basin which feeds the FBRs. Remaining chromium from the precipitation unit is biologically reduced in the FBR reactors. Currently chromium and perchlorate contamination at the site is prevented from reaching the Las Vegas Wash and Lake Mead by a system of intercepting wells including the Interceptor Well Field (IWF), the Athens Road Well Field (AWF), and the Seep Well Field (SWF). According to the 2015 NERT Performance Evaluation Report (Ramboll Environ, Oct 30, 2015), the highest concentrations of chromium are upstream from the IWF (3.6-25 mg/L). Concentrations upstream from the AWF and SWF are 68-270 mg/L and < 0.0040 mg/L, respectively. Therefore, the largest chromium concentrations are in the plume upstream of IWF, in the Ammonium Perchlorate (AP) area, where Tetra Tech is planning to conduct chemical and biological pilot remediation testing. Chromium present in the area is in the hexavalent form (Cr (VI)). The proposed location for the pilot test is the Southwest portion of the site close to wells M-22 (future biological pilot test) and M66 (future Chemical precipitation unit).

1.1 Objectives of Bench-Scale Remediation Testing

Prior to commencing pilot testing on site, bench-scale testing was performed by the Environmental Engineering and Water Quality Laboratory at the University of Nevada Las Vegas (UNLV). The objectives of the bench-scale testing were:

- 1) To evaluate whether calcium polysulfide (CaSx), a reducing agent commonly used in the winery industry, will be effective in chemically reducing chromium in-situ at the NERT site. Calcium polysulfide has been used effectively in treating groundwater (Freedman et al., 2005; Graham et al., 2006; Messer et al., 2003; Yu and Tremaine, 2002), brines (Pakzadeh and Batista, 2011), and residues (Graham et al, 2006) contaminated with high levels of chromium;
- 2) To compare the effectiveness of CaSx with that promoted by ferrous sulfate in reducing total chromium and hexavalent chromium to the concentrations stipulated in the NERT NPDES permit—0.01 mg/L (10 ppb) for Cr (VI) and 0.1 mg/L (100 ppb) for total chromium.
- 3) To investigate the potential for in-situ biological reduction of chromium and co-contaminants using various types of substrate as electron donors.

This report includes the results obtained for the chemical reduction of chromium and biological reduction of chromium and co-containants, using both microcosms and column testing. The testing used soil and groundwater extracted from the quaternary alluvial (QAL) and the Upper Muddy Creek Formation (UMCf) zones of the NERT site.

CHAPTER 2 METHODOLOGY

2.1 Soil and Groundwater Sample Collection from the NERT Site and Blending

Soil and groundwater used in this study were obtained from a borehole drilled at the NERT pilot test site. Soil samples were collected from three intervals 23- 48 feet below ground surface (ft bgs) by Tetra Tech. Soil samples were collected from UFIW-02S (QAL, 23-28 ft bgs), UFIW-02I (Intermediate between QAL and UMCf, 31-36 ft bgs), and UFIW-02D (UMCf, 43-48 ft bgs). Later, soil samples from CTMW-03S (QAL, 18 to 23 feet bgs) and CTIW-01D (UMCf, 33 to 38 ft bgs) were collected for biological tests. The soil samples were collected using sterile hand shovels and sterile 3-gallon plastic buckets provided by UNLV. Prior to sample collection, the buckets were soaked for 2 hours with 5% chlorine solution and then rinsed 8 times with deionized autoclaved water and allowed to air dry covered with autoclaved aluminum foil. The shovels were flame-sterilized using ethyl alcohol and then wrapped with aluminum foil and sent to the field. Approximately 6 gallons of soil cuttings (two 3-gallon buckets) were collected from each drilling interval.

Groundwater samples were collected using sterilized 5-gallon plastic containers from well UFIW-06S (QAL, screened at 25-30 ft bgs) and well UFIW-06I (UMCf, screened from 35-40 ft bgs). In later tests, groundwater samples were also collected from UFIW-03, CTIW-01, and CTMW-03. Some groundwater was collected from well BMW1, however it was only used in preliminary testing of chromium removal using columns, found in section 2.5.1 and Appendix D. Groundwater and soil samples were transferred to the laboratory immediately after collection and were refrigerated at 32°F. Groundwater and soil samples were used for batch chromium chemical reduction tests.

To generate homogeneous, representative soil samples, equal volumes of soil (about a gallon) were collected from each of the two buckets from each soil depth interval and were thoroughly mixed in a clean, disinfected plastic pan using shovels. The wet blended samples were used for chemical soil analysis and biological reduction batch tests. The remaining blended soil (\sim 2 gallons) from each depth was transferred to three sterile, shallow plastic pans and placed outdoors to air-dry ($105^{\circ}F$ in the sun). Samples were

loosely covered with cloth towels to avoid contamination while outside. These air-dried soil samples were used for grain size distribution and columns (Chapter 3).

For batch and column testing, two of the soil samples from the soil horizon 23-28 feet and 43-48 feet were selected as alluvial (QAL) and Muddy Creek Formation (UMCf), respectively.

2.2 Analysis of Soil and and Groundwater Samples

The blended wet samples were analyzed for chromium, perchlorate and nitrate first in liquid extracted from the soil moisture, and then later by rinsing the soil with nanopure water. For groundwater, additional parameters such as COD, pH, and turbidity were also measured. The results for these analyses are discussed in Chapter 3.

2.2.1 Characterization of Soil Samples

Contaminants Measured in the Dry Soil from UFIW-02 Well

Twenty grams of soil were weighed in triplicate from each soil depth and dried in an oven at 105°C for 12 hours for moisture content computations. The moisture content was used to determine the concentration of contaminants in the soils on a dry weight basis. Data from the dry soil testing can be found in section 3.1.

Contaminants Measured in the Soil Moisture from UFIW-02 Well

About 200 g of wet blended soil from each horizon from the UFIW-02 well (23-28 ft bgs, 31-36 ft bgs, and 43-48 ft bgs) were weighed and centrifuged for an hour at 4,400 rpm to extract water from the soil samples. In the first attempt, only the sample from 31-36 ft bgs yielded liquid. Therefore, the procedure was modified and the amount of soil was doubled (i.e. \sim 400 g). This procedure yielded moisture from two sample intervals (31-36 ft bgs and 43-48 ft bgs), but no liquid was obtained from the shallowest sample (23-28 feet bgs). The extractions of liquid from soil depths 31-36 ft and 43-48 ft were repeated three times with 400 g soil until a volume of about 25 mL liquid was collected from each horizon for the chemical analysis. The data resulting from the chemical analyses are presented in 3.1.2.

<u>Contaminant Extraction from UFIW-02 Well, CTMW-03S, and CTIW-01D by Rinsing Soil</u> <u>with Nanopure Water</u>

Five different soils were tested by rinsing with nano pure water: three different horizons for UFIW-02 (QAL 23-28 ft bgs, QAL 31-36 ft bgs, and UMCf 43-48 ft bgs), CTMW 03 S (QAL 18-23 ft bgs), and CTIW 01D (UMCf 33-38 ft bgs). For each soil, fifty grams of wet soil were transferred to 250 mL centrifuged bottles and 100 mL nanopure water was added. The mixture was placed in a rotary shaker at 45 rpm for 24 hours. After mixing in the rotary shaker, the samples were centrifuged for 30 minutes at 4400 rpm (Legend RT Sorvall centrifuge, Thermo Fisher Scientific, Inc., Waltham, MA). The supernatant was carefully transferred to graduated cylinders to measure the volume, and was then stored in labeled vials.

For the second rinse, 100 mL DI water was added to each bottle and the bottles were transferred back to the rotary shaker for 24 hours. The content was centrifuged for 30 minutes and the supernatant was carefully transferred to another vial. A third rinse was carried out using the same procedure to generate a third rinsate. The rinsate volumes collected were noted for each rinse, and were filtered and analyzed on the same day for Cr (VI) and nitrate. All the samples were refrigerated at 32°F prior to perchlorate analysis. Cr (VI), nitrate, and perchlorate are reported as as μg or $\mu g/kg$ soil. The mass of contaminant in each extract was calculated by multiplying the concentration measured and the rinsate volume. The mass was then divided by the amount of dry soil (accounting for moisture content for the 50 grams of wet soil) used for extraction. Results can be found in section 3.2.

For each soil horizon, the first rinse sample was also analyzed for chemical oxygen demand COD (a measure of the organic content), hardness, phosphate, sulfate, and total dissolved solids (TDS). Table 2.1 shows the analytical procedure used for each analyte of interest in the extract of soil.

2.2.2 Characterization of Groundwater Samples

The groundwater samples' chemical constituents were measured directly in filtered (0.2 µm membrane filters-VWR Scientific) groundwater samples. Table 2.1 shows the

analytical procedure used for each analyte of interest in the groundwater samples. Groundwater characterization is further addressed in section 3.3.

2.3 Analytical Methods Used for Chemical Characterization of Soil and Groundwater

Table 2.1 lists all the constituents that were analyzed in this study and corresponding methods of analysis.

Table 2.1: Analytical Procedures Used in the Study

Parameter	Method details/ Reagents used	Hach method or EPA method	Limits	Equipment	
COD	Ultra Low Range Low Range, High Range, High Range Plus	8000	0.7 to 40 mg/L (ULR); 3 to 150 mg/L (LR); 20 to 1500 mg/L (HR); 200 to 15,000 mg/L (HR Plus)	(LR); Spectrophotometer (Hach DR 5000)	
Ammonia	Low Range, High Range	10031	.4 to 50 mg-N/L (HR)	Spectrophotometer (Hach DR 5000)	
Nitrate	NitraVer® 3	10020	0.2 to 30.0 mg-N/L (HR)	Test 'N Tube™ Vials	
Chlorate/Perchlorate	KOH (eluent)	314.0	2.0 to 0.53 μg/L	Ion Chromatograph (Dionex ICS-2000)	
Phosphate	PhosVer® 3	8048	0.02 to 2.5 mg/L	Spectrophotometer (DR 5000)	
Sulfate	SulfaVer® 4	8051	2 to 70 mg/L	Spectrophotometer (DR 5000)	
Total Iron	FerroVer®	8008	0.02 to 3.00 mg/L	Spectrophotometer (DR 5000)	
Hexavalent Chromium	ChromaVer® 3	8023	0.010 to 0.700 mg/L (spectrophotometers); 0.01 to 0.60 mg/L (colorimeters)	Spectrophotometer (Hach DR 5000Colorimeter (DR 900)	
рН	pH buffer solution	8156	0 to 14 pH mete		
Total metal (trace and major metal)		200.7		Thermo ICP 6300	
Total Dissolved Chromium		200.7		Thermo ICP 6300	

Replicate analyses were run for every 5 samples processed.

2.4 Batch Chemical Reduction Tests for Chromium

For bench-scale testing purposes, low and high Cr (VI) concentrations were established as 500 μ g/L and 10000 μ g/L, respectively. Table 2.2 shows the permit limits and targeted removal (%) in groundwater contaminated with low (500 μ g/L) and high (10000 μ g/L) concentrations of chromium.

Table 2.2: NPDES limit for chromium (Cr (VI) and total) and corresponding target removals (%) in groundwater with low and high concentrations of chromium

Category based on chromium	Chromium NPDES limit (μg/L)		Target removal (%)	
concentration	Cr (VI)	Total	Cr (VI)	Total
Low (500 μg/L)	10	100	98	80
High (10000 μg/L)	10	100	99.9	99

2.4.1 Groundwater Used for Batch Testing

Samples from UFIW-06S (OAL) and UFIW-06I (UMCf) were specifically collected for chemical batch tests. The concentrations of Cr (VI) in both groundwater samples were less than 0.5 mg Cr⁺⁶/L. Therefore, the groundwaters from both QAL and UMCf were spiked with a Cr (VI) standard (Hach, Loveland, Colorado) to achieve about 10,000 μg Cr⁺⁶/L for a 'high concentration' testing; for 'low concentration' testing, the groundwaters were either used as they were (i.e. no spiking) or were spiked to achieve about 500 ug Cr+6/L. There were analytical interferences detected with measuring Cr (VI) in the spiked 'low concentration' QAL groundwater. The QA/QC identified that readings of Cr (VI) levels below 0.05 mg/l were not reliable because the method would give different readings when duplicate samples were analyzed. The various tests conducted to investigate analytical interference with chromium (VI) detection in the QAL groundwater are presented in Appendix A. The solution to the interference was to dilute the QAL groundwater by 100X before adding chromium to achieve the desired chromium concentration. In addition, dissolved chromium was measured using inductively coupled plasma (ICP). No interference was found when measuring total chromium using ICP in QAL or UMCf samples.

2.4.2 Preliminary Batch Testing for Cr (VI) Reduction in Groundwater at High and Low Concentration Using CaSx and FeSO₄

Batch chemical reduction tests were conducted in 1L glass beakers using a Phillip and Bird Batch Tester (Figure 2.1). A preliminary batch test was performed to select a range of coagulant (i.e. CaSx or FeSO₄) to chromium ratios. Preliminary batch test ratios were guided by ratios reported by Pakzadeh and Batista (2011) and Qin et al. (2005). The preliminary batch groundwater tests were performed on groundwaters without spiking (for low chromium test) and groundwaters spiked with $\sim 10,000~\rm Cr^{+6}/L$ (for high chromium test). The theoretical stoichiometric requirement for CaSx is 1.5 moles of CaSx per moles of Cr (VI) and for ferrous sulfate is 3 moles of Fe per mole of Cr (VI). The CaSx to Cr ratios selected for preliminary test were 2 and 3 times the stoichiometric ratio, and the ferrous sulfate (as Fe) to chromium ratios selected were 10 and 30 times the stoichiometric ratio. The matrix of tests used in the preliminary batch test is shown in Appendix B.

In these tests, CaSx and ferrous sulfate were used as coagulants to remove Cr (VI) as per equations below:

$$2 \text{ CrO}_{4^{-2}} + 3\text{CaS}_5 + 10\text{H}^+ \rightarrow 2 \text{ Cr (OH)}_3 + 15 \text{ S}_+ 3\text{Ca}^{+2} + 2\text{H}_2\text{O}$$

 $3\text{Fe}^{+2} + \text{CrO}_{4^{-2}} + 3\text{e}^- + 5\text{H}^+ \rightarrow \text{Cr (OH)}_3 + 3\text{Fe}^{+3} + \text{H}_2\text{O}$

For the preliminary batch tests, 250 or 500 mL of groundwater containing Cr (VI) were placed in a glass beaker. The coagulant dose was added and the contents of each beaker (i.e. water, any suspended solids, and coagulant) were stirred rapidly at 100 rpm for a minute. Next, the mixer speed was decreased to to 30 rpm for a period of 30 minutes to promote slow mixing. The contents of the beaker were transferred to a graduated cylinder to allow formed solids to settle. The solids volume was recorded after 10 minutes settling time. The goal was not to obtain a clear effluent, such as often desired in water treatment, because when used in-situ treatment the precipitates formed by the coagulants are retained by the soil. About 100mL of supernatant from the graduated cylinder were transferred into vials to measure pH, total chromium, and turbidity. For dissolved chromium analysis, about 25 mL of the supernatant was preserved with trace metal quality

nitric acid for ICP analysis. The remaining content of the graduated cylinder was then transferred to a large bottle and centrifuged for 30 minutes at 3000 rpm. The supernate was carefully poured and was filtered (0.45 μ m membrane filter) to analyze for nitrate, perchlorate and hexavalent chromium. The solids were transferred into preweighed aluminum dishes for suspended solids testing. The blades and the beaker walls were inspected for scale formation. The preliminary results of the batch tests are presented in Appendix B.

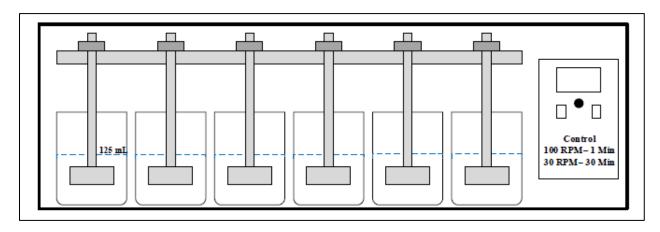


Figure 2.1 Experimental setup used in the batch tests for chromium precipitation with CaSx and FeSO₄.

2.4.3 Secondary Batch Testing for Cr (VI) Reduction at High and Low Concentration Using CaSx and FeSO₄

Six sets of secondary batch tests were conducted with the methods described in section 2.4.2. Each set comprised of six beakers. QAL and UMCf groundwaters were spiked with Cr (VI) for high (10,000 μ g Cr⁺⁶/L) and low (500 μ g Cr⁺⁶/L) concentrations testing. The batch testing was conducted with varying ratios from 1.5X to 5X times the stoichiometric requirement for CaSx and 5X to 50X times the stoichiometric requirement for ferrous sulfate. The testing matrix is shown in Table 2.3.

Table 2.3: Matrix Used for Cr (VI) Removal Using CaSx and FeSO4

Sets	Cr concentration	Groundwater source and concentration	Ratio for CaSx X Stoichiometric requirement	Ratio for FeSO ₄ X Stoichiometric requirement
Set 1 Set 2	High Cr concentration	QAL at 10500 μg Cr ⁺⁶ /L UMCf at 9800 μg Cr ⁺⁶ /L with 1 g of dry soil/L	1.5X, 2X, 3X, 4X and 5X, and replicate 2X	5X, 10X, 20X, 30X and 50X, and replicate 10X
Set 3	(Target starting: $10000 \mu g$ Cr ⁺⁶ /L) Groundwater in each beaker = $250 \mu L$	QAL at 10500 μg Cr+6/L with filtered groundwater and with and without 1 g of dry QAL soil/L	5X and 10X, and replicate 5X (3 beakers without soil and 3 beakers with soil)	N/A
Set 4	-	UMCf at 9800 µg Cr+6/L with filtered groundwater and with or without 1 g of dry QAL soil/L	N/A	5X and 10X, and replicate 5X (3 beakers without soil and 3 beakers with soil)
Set 5	Low Cr concentration	QAL at 500 μg Cr ⁺⁶ /L	1.5X, 2X, 3X, 4X	5X, 10X, 20X, 30X and
Set 6	(Target starting: 500 μg Cr+6/L) Groundwater in each beaker = 500 mL	UMCf at 500 μg Cr+6/L	and 5X, and replicate 2X	50X, and replicate 10X

Batch test sets 1-4 were conducted for high Cr concentrations. The preliminary test showed that the groundwater from the UMCf had very low turbidity and did not coagulate well with the dosages of FeSO₄ and CaSx. Therefore, soil was added such that 1 g dry UMCf soil/L of UMCf groundwater was maintained in batch set 2 (0.25 g in each beaker with 250 mL groundwater).

Batch test sets 3 (QAL with CaSx) and 4 (UMCf with FeSO₄) were operated to investigate the effect of suspended solids (i.e turbidity) in high Cr (VI) concentration tests. The groundwater from both depths was filtered through a coffee filter (about 20 μ m) and hexavalent chromium was added to increase chromium concentration to about 10,000 μ g Cr⁺⁶/L. Three of the six tests in batch test set 3 were operated with 250 mL coarsely filtered groundwater; the other three batch tests were performed with coarsely filtered groundwater to which QAL or UMCf soil was added to obtain 1 g dry soil/L of groundwater. All testing matrices are presented in Appendix C. Batch test sets 5 and 6 were performed with low hexavalent chromium concentration spikes. The results and discussion of the six sets of secondary batch tests can be found in section 4.1.

2.5 Column Testing for Cr (VI) Removal Using Calcium Polysulfide

2.5.1 Preliminary Column Testing

Column tests were performed to simulate in-situ remediation using chemical reduction of chromium. A preliminary test was run with two columns for 36 days. The columns were packed with the QAL and UMCf soils, respectively. The preliminary column testing was performed for low concentration chromium in groundwater (spiked with 1000 μg Cr+6/L). Two-inch diameter columns were packed with dried soil from the site to mimic the groundwater aquifer and flow velocity. Experimental setup details and results of the preliminary column tests are presented in Appendix D (Schematic diagram is presented in Figure D1). Based off of previous experience working with very fine soils, the columns were packed on a "sandwich"-like scheme, so the soil where the testing took place was layered between a well built base and a top cap. The bottom of the column was filled with glassbeads and gravel followed by packed soil (13 inches) to form a contact between the glass beads and the other materials to follow. Above the contact soil, about a half inch of gravel was placed and the injection port was filled with 1/4th inch glassbeads (1 inch height). Next, a layer of gravel (0.5 inches) was placed above the glassbeads, packed with soil (about 2 inches). Next, a layer of gravel (0.5 inch) was placed on top of the soil. All the columns were then saturated with groundwater on a downflow mode.

The QAL column was gravity fed and the UMCf column was operated at 30 psi using a pressure valve built in-house at the UNLV Mechanical Shop. The low hydraulic conductivity of the UMCf required higher pressure to facilitate flow within the time frame allocated for the project. The dosages of CaSx used were based in the results obtained in the batch tests. Based on the batch testing, CaSx at 2X the stoichiometric ratio was selected for the chemical column tests (ie. 34 mL/1000 L groundwater in both QAL and UMCf columns). However, considering the mixing issue in the columns, a factor of 10 was selected. Thus, an effective dosage of twenty times (20X) the stoichiometric requirement (ie. 340 mL/1000L groundwater) was used.

The calcium polysulfide was injected once a day into the UMCf column. A syringe was inserted through a port drilled at about 1 inch above the contact soil in the column. It

was not possible to inject manually because of the 30 psi pressure built up in the UMCf column, therefore the pressure pump had to be shut down before injecting the CaSx. It was noted that upon shutting down the pressure, the soil expanded and a fine horizontal crack formed in the cover soil. The cracks were invisible when the pressure pump was started again. Initially, it was not considered problematic because the crack was not observed in the contact soil. However, later more prominent cracks were observed in the contact soil and CaSx diffused upward through the cracks into the water above the cover soil. For the QAL column, an Intravenous (IV) and was used to maintain CaSx flow at a rate of 370 to $400~\mu$ L/min continuously. The IV required frequent replacement to prevent excessive flow of CaSx into the column. The preliminary columns' results are shown in Appendix D.

2.5.2 Secondary Column Testing for Cr (VI) Reduction in Groundwater at High and Low Concentration Using CaSx

Three columns were operated to examine the reduction of hexavalent chromium at low (1000 μ g Cr⁺⁶/L) and high (10,000 μ g Cr⁺⁶/L) concentrations using CaSx. Two columns were fed with low-chromium concentration groundwater (1000 μ g Cr⁺⁶/L), one column packed with QAL soil (QAL column) and the other with UMCf soil (UMCf A column). A third column, packed with UMCf soil, was fed with high-chromium groundwater (10,000 μ g Cr⁺⁶/L) (UMCf B column). Both UMCf columns were operated at 15 psi and the QAL column was gravity fed. Figure 2.2 shows the schematic diagram of the columns and their dimension (A picture of the set-up is presented in Appendix F). In this experiment, the total contact depth for calcium polysulfide and chromium was 25 inches. All the columns were filled with glass beads (2 inches) at the injection port and a layer of small sized gravel with coarse sand was placed above it. About 6 inches of soil was then packed and capped with gravel. The cover soil was used as a barrier and hence was not considered as contact soil depth. Approximately 5 kg of soil was packed into the columns including the contact depth and the cover soil.

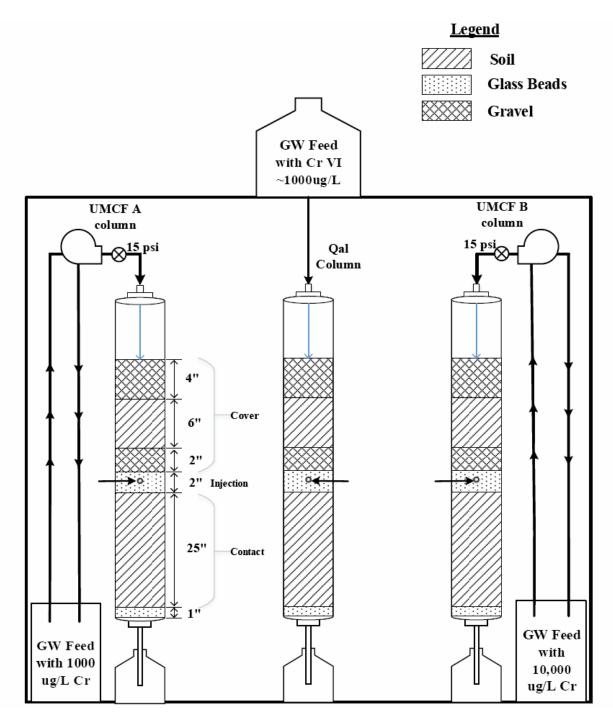


Figure 2.2: Schematic diagram of columns for chemical precipitation of chromium in columns using calcium polysulfide. The horizontal arrows at 27 inches from the bottom of the column indicate the injection port for calcium polysulfide.

Operation of the Columns

Table 2.4 shows the operation procedure for each column. In the beginning, the columns were fed with chromium spiked groundwater without calcium polysulfide. After two days, the concentration of chromium in the effluent was close to that in the influent, indicating the soil and pore spaces were saturated with chromium. The columns were operated for 24 days due to clogging of the effluent valves by movement of the fines contained in the soil. The effluent valve required daily cleaning to keep columns operating properly. Once the flow in the column was stabilized—between 24 and 26 days for each column—CaSx injection was initiated. The day CaSx was injected was recorded as Day 1 for data analysis purposes, excluding the days operated without CaSx (for hydraulic purposes). The calcium polysulfide dosage selected was 2X stoichiometric, based on the batch test results. However, considering potential mixing issues due to very fine grained soils, 20X stoichiometric was used for the low concentration columns and fourty times (40X) for columns with high concentration chromium (10,000 μg Cr⁺⁶/L). For the QAL column, half of the estimated amount of CaSx (ie. 2 mL CaSx) was injected twice everyday (ie. 1 mL on each injection). For the UMCf A and B columns, 0.3 mL CaSx and 1 mL CaSx, respectively, were injected once a day.

The operation of the columns included measurement of flow rate, throughput volume, pH, hexavalent chromium (as a 24-hour composite sample and a grab sample), and total chromium (in composite samples). Every two days, groundwater spiked with 1000 μg Cr+6/L or 10000 μg Cr+6/L was prepared and added to the feed tanks. The chromium concentration in the feed tank was measured every time new groundwater was added to the tank.

Table 2.4: Operation of Chemical Precipitation Columns

	Number of Days					
	QAL UMCf A		UMCf B			
Operation Phase	1000 μg/L	1000 μg/L	10000 μg/L			
Without calcium polysulfide	36	34	24			
Injection of calcium polysulfide	1 to 30	1 to 17	1 to 23			
No injection with same Cr (VI) concentration	31 to 44	30 to 46	24 to 36			
No injection with Cr (VI) increased by 10X	44 to 51	46 to 53	36 to 39			

In the last weeks of testing—because breakthrough in the columns did not occur after stopping CaSx addition—the influent chromium concentration was increased by 10X to promote breakthrough.

Chromium Analysis

Chromium in the effluent of the columns was analyzed in 24-hour composite sample and in grab samples, both collected at the same time. The samples were collected before the injection of CaSx, therefore, the composite samples are likely to have lower chromium concentrations than the grab. This is only the case because chemical injection happened after sample collection. The grab samples collected were filtered and analyzed the same day for Cr (VI) using the Hach 8023 method. The composite samples were preserved with nitric acid and analyzed by ICP within 15 days. The composite samples were not filtered and were relatively clear due to filtering through the column. The goal was to mimic in-situ applications, where the formed precipitates are trapped in the pores of the soil. The discussion of secondary column testing continues in section 4.2.

2.6 Batch Test for Biological Reduction

All microcosm tests were performed using 125 mL autoclave-sterilized borosilicate glass bottles. In all tests, 30 grams of wet soil were transferred to the glass bottles. Next, a total of 100 mL of groundwater, nutrients, and desired amount of substrate were added. The volume of substrate added was to achieve 100 times the stoichiometric demand considering chromium, nitrate, perchlorate and chlorate concentration (Stoichiometric demand calculations are presented in Appendix E). Table 2.5 summarizes the microcosm tests performed including the substrate types and well sources for soil and groundwater. Although the initial project was envisioned for Cr (VI) degradation only, the presence of cocontaminants (i.e. nitrate, chlorate and perchlorate) resulted in the evaluation of biological reduction for all major contaminants present in the groundwater.

Table 2.5: Summary Table with Well ID of Soil and Groundwater

Biodegradation experiment	We	Vell ID for			
	Soil sample	Groundwater			
Trial Testing of Microcosm Using EOS-PRO, Industrial Sugar Wastewater and Molasses (Appendix)	UFIW-02 S (23-25 feet, QAL) and UFIW-02 I (31-36 feet, UMCf) UFIW-03	UFIW-06S (QAL) and UFIW-06I (UMCf) (spiked with 5 mg/L Cr ⁺⁶)			
Preliminary Microcosm Using EOS-PRO, Industrial Sugar Wastewater, and Mixture of the two substrates	CTMW 03S for QAL and CTIW 01D for UMCf	CTMW 03S (QAL) CTIW 01D (UMCf)			
Microcosm Using Mixture of EOS-PRO and Industrial Sugar Wastewater (3 parts of EOS- PRO and 12 parts of Industrial Sugar Waste) with Di-ammonium Phosphate					
Microcosm Using Mixture of EOS-PRO and Sugar (to test as Substitute for Industrial Sugar Waste)					

The microcosm bottles were crimped closed using butyl rubber caps and aluminum rings to ensure anaerobic/anoxic conditions, and were continuously mixed in a rotary shaker at 30 rpm at room temperature. All tests were performed in duplicate. At predetermined time intervals, one bottle and its duplicate were tested and sacrificed, unless otherwise specified. The microcosm bottles were taken out of the rotor and were left to settle solids for at least 6-8 hours. This settling was necessary because of the very fine nature of the soil encountered in the AP area and used in the testing. The liquid from the microcosm bottles was decanted and filtered through a 0.2 μ m membrane filter (Paul Laboratories). The filtered samples were analyzed for Cr (VI), nitrate, perchlorate, chlorate, and COD. COD measurements for this project quantify the amount of organic carbon present either as emulsified oil, Industrial Sugar Wastewater, molasses, or sugar.

Nutrient Addition

Phosphorus was added to supplement the Industrial Sugar Wastewater and molasses microcosms because their phosphorus content was not sufficient to support microbial growth. The EOS-PRO oil contains phosphate. A nitrogen source was not initially added because soils and groundwater of the NERT site contained significant amounts of nitrate that could serve as a source of nitrogen for bacteria. However, in some microcosms,

after all nitrate was degraded, di-ammonium phosphate was added to supply both nitrogen and phosphorus.

Control Microcosms

The control microcosms introduced were: 1) Blank, without addition of substrate (BLK), 2) Industrial Sugar Wastewater without phosphate, and 3) Molasses without phosphate. The control microcosms were tested for both QAL and UMCf. No substrate was added to the BLK microcosms to test biodegradation rates in the absence of an external electron donor. Control microcosms without phosphate were introduced to investigate the impact of phosphate—a nutrient for bacteria—on chromium, nitrate, chlorate, and perchlorate biodegradation.

2.6.1 Phase I Microcosms for Biodegradation of Chromium, Perchlorate, and Nitrate using EOS-PRO, Industrial Sugar Wastewater, a Mixture of EOS-PRO and Industrial Sugar Wastewater, and Molasses as Substrate

For this experiment, 128 microcosms were prepared including microcosms for the selected substrates and each substrate's control microcosms—i.e. without phosphate, and blanks. The substrates selected were: EOS-PRO, Industrial Sugar Wastewater, a mixture of the Industrial Sugar Wastewater and EOS-PRO, and molasses. The experimental matrix used in the microcom tests is depicted in Appendix E (Table E.5). About 15% by volume and 10% by volume DI water was added to EOS-PRO and Mix microcosms, respectively, to account for the dilution contributed by the phosphate buffer addition in the Mix and Industrial Sugar Wastewater microcosms.

During this phase of testing, some microcosms were sampled and then returned to the rotors to be re-sampled on a later date. Re-sampling was performed because the degradation took longer than expected and it was necessary to ensure enough bottles were available for the study. However, in general, the microcosms that were sacrificed were centrifuged, filtered, and analyzed for the contaminants of concern. Nitrate, Cr (VI), perchlorate, chlorate, COD and phosphate were measured. The high total dissolved solids (TDS) present in the AP area groundwater resulted in poor detection of chlorate using the

UNLV ion-chromatograph method—that typically used for the NERT samples. To check chlorate degradation, some samples were sent to Silver State Labs, a certified commercial laboratory in Las Vegas. Total dissolved chromium concentrations were analyzed using inductively coupled plasma (ICP) at a certified university laboratory with our partner Utah State Laboratories. Samples for total dissolved chromium analysis by ICP were preserved with nitric acid at pH =2. The results and discussion of the first phase of batch biological tests can be found in section 5.1.1.

2.6.2 Phase II Microcosms with EOS-PRO and Industrial Sugar Wastewater as Substrate (at 3 parts EOS-PRO: 12 parts Industrial Sugar Wastewater Ratio) and with Di-ammonium Phosphate

The experimental matrix used in these microcosm tests is depicted in Appendix E (Table E.6). For these tests, a mixture of EOS-PRO and Industrial Sugar Wastewater (referred to as Mix), was selected as the substrate. The substrate was comprised of three parts of EOS-PRO and twelve parts of Industrial Sugar Wastewater by volume. The hypothesis for adding Industrial Sugar Wastewater to EOS was to provide a readily biodegradable compound that would jump start biological reduction faster than when EOS-PRO is used alone.

For all microcosms, di-ammonium phosphate (P) was added except for the control (without phosphate). The controls introduced were: 1) blank (without substrate), and 2) Mix without P. The phosphate was added such that about 140 mg P/L was present in the QAL and UMCf microcosms. On Day 120, about 10% by volume DI water was added to all remaining microcosms to dilute the high TDS present—pre-existing TDS plus that resulting from chlorate degradation. Soluble COD (dissolved in the aqueous phase), nitrate, perchlorate, chlorate, Cr (VI), phosphorus, and total dissolved solids (TDS) were measured. Section 5.1.2 contains the results and discussion of the Phase II microcosm tests.



Figure 2.3: Microcosms with EOS-PRO and Industrial Sugar Wastewater as substrate at (3 parts of EOS-PRO: 12 parts of Industrial Sugar Waste) ratio and with di-ammonium phosphate

2.6.3 Microcosms with Sugar as Substrate to Substitute for Industrial Sugar Wastewater

Table E.7 in Appendix E depicts the experimental matrix used in these microcosm tests. A mixture of EOS-PRO and food grade sugar (Mix-Sugar) was used as the substrate and phosphate buffer (P) was added in all microcosms except for one control (without phosphate). The controls introduced were: 1) blank (without substrate), 2) Mix without phosphate, and 3) Sugar only. Soluble COD, nitrate, perchlorate, chlorate and Cr (VI) were measured and the data can be found in section 5.1.3.

2.7 Column Test for Biological Reduction

The biological reduction of chromium and co-contaminants was evaluated using four columns. Two of the columns were packed with soil from depths 25-30 ft (Alluvial layer) termed QAL columns and two with soil from 35-40 ft (Muddy Creek Formation) termed UMCf columns. The columns were 2 inches in diameter and 50 inches long. Approximately 3 kg of dried QAL soil was packed in each QAL column and about 2.3 kg of

dried UMCf soil was packed in each UMCf column. The approximate bulk densities of soil were 1,300kg/m³ for a QAL column and 910 kg/m³ for UMCf. The characteristics of the soils used in the columns are shown in Table 2.6. Notice that QAL materials are heavier with bulk density 1.43 times greater than that of UMCf. However, UMCf material is more porous with a porosity of 65.64% compared to 48% for QAL. The field data for this site generated by Tetra Tech (e-mail from Carl Lenker Sept 14, 2017) show dry bulk densities for QAL and UMCf varying from 1.10 - 1.56 and 0.8 - 1.29, respectively. Therefore, the bulk densities measured in the laboratory columns after packing are similar to values measured in the field. In the field data generated by Tetra Tech, QAL and UMCf porosities vary from 35-61% and 51-66.8%, respectively. Thus, the values measured in the laboratory are within the range measured in the field and show much larger porosity for UMCf (65.64%) as compared to that of QAL (48%).

For the biodegradation tests, columns were fed with groundwater from the CTMW-03S well for QAL and CTMW-03D for UMCf. Before biodegradation testing started, the dried soils were saturated with groundwater, free of any electron donor or nutrients.

Table 2.6: Parameters of the Soil Used in the Biological Columns

	QAL	UMCf
Volume of column occupied by soil (excluding the top cover), \mbox{cm}^{3}	2329	2329
Weight of soil used in column, g	2213	3026
Bulk density of dry QAL and UMCf, g/cm ³	1.3	0.91
Volume of solids only in the soil (estimated based on bulk density),		
cm ³	1146.8	802.57
Estimated porosity of the column (%)	48	65.64

The QAL columns were gravity fed at first, and then were pressurized to 5 psi from Day 28 because the flowrate decreased significantly. This decrease is attributed to settling of the fine grained material present in QAL in the lower portion of the column as groundwater passed through. During saturation, the UMCf columns were pressurized at 15 psi, but the pressure was reduced to 10 psi from Day 1 of the operation of the columns. An in-house built pressure valve was used to pressurize the soil columns along with an Aquatec CDP6800 booster pump. Figures 2.5a and 2.5b depict the schematic diagrams of the experimental set up used in the column testing. Note that both UMCf and QAL columns were operated under pressure after Day 28 (Figure 2.5). The operation details for the UMCf and QAL columns are shown in Table 2.7. Notice that the column feed solution composition was changed with time. Compositions included groundwater (GW) with EOS-PRO, a mixure of Industrial Sugar Wastewater and EOS-PRO, and GW alone.

The effluent valve in the QAL columns had clogging issues due to fines flowing with groundwater. To resolve the clogging issue, the effluent valves in the QAL columns were cleaned and the columns were operated only with groundwater for five days. Therefore, the UMCf columns and QAL columns were operated five days apart. The day for the substrate injection into the QAL columns (Day 1) corresponds to Day 6 for the UMCf columns.

Table 2.7: Operation Details for QAL and UMCf columns Used to Investigate Biological Reduction of Chromium and Co-contaminants

Substrate		QAL operation		UMCf operation
variation	Days	Variation in feed	Days	Variation in feed
High amount of substrate (comparing the impact of Industrial Sugar	1-2 3-5 6-8	7% Industrial Sugar Wastewater and 2% EOS-PRO in 91% GW (45880 mg/L COD equivalent) Dilution of the previous feed by GW GW only	1-7 8-10 11-13	7% Industrial Sugar Wastewater and 2% EOS-PRO in 91% GW 45880 mg/L COD equivalent) Dilution of the previous feed by GW GW only
Wastewater, no substrate and EOS-PRO	9-14	7% Industrial Sugar Wastewater and 2% EOS-PRO in 91% GW(45880 mg/L COD equivalent)	14-19	7% Industrial Sugar Wastewater and 2% EOS-PRO in 91% GW 45880 mg/L COD equivalent)
alone) -	15-17 18-29	0.2% EOS-PRO in 99.8% GW(4000 mg/L COD equivalent) GW only	20-31	0.2% EOS-PRO in 99.8% GW (4000 mg/L COD equivalent)
	30-36	0.4% EOS-PRO (8000 mg/L COD equivalent)	32-40	0.4% EOS-PRO in 99.6% GW (8000 mg/L COD equivalent)
Low amount of substrate	37-160	1.5% Industrial Sugar Wastewater and 0.4% EOS- PRO and 1.9% Phosphate in 96.2% GW (9260 mg/L COD equivalent)	41-165	1.5% Industrial Sugar Wastewater and 0.4% EOS-PRO and 1.9% Phosphate in 96.2% GW (9260 mg/L COD equivalent)

The columns were disturbed twice for two hour periods due to power outages in the building on Days 105 and 110. In the QAL columns, some cracks in the packed material were observed on Day 106 which resulted in high effluent flow; a constant flow could not be maintained until Day 113. On Day 120, small cracks on the material inside UMCf column B were also observed. The UMCf columns, despite the very fine nature of the clay material, ran much smoother than the QAL columns. The results and discussion of the column tests are presented in section 5.2.

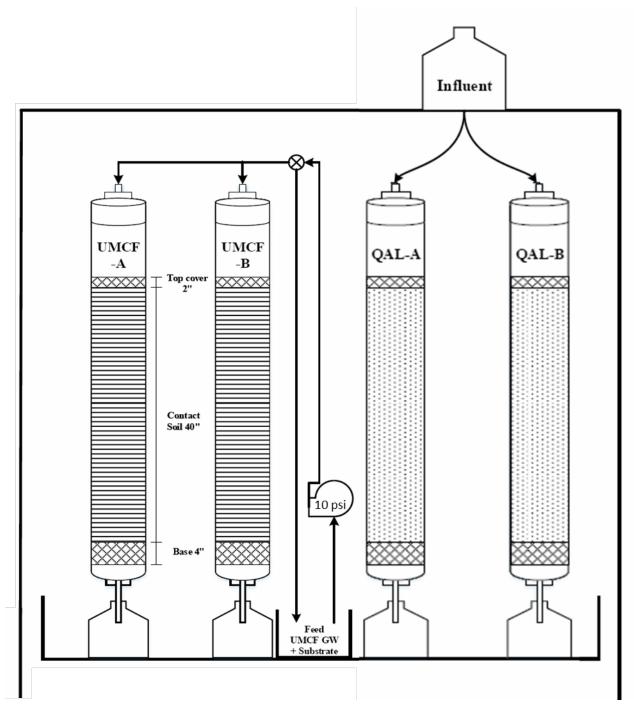
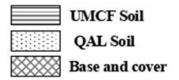


Figure 2.4: Schematic diagram of columns used for biological treatment of the UMCf and QAL contaminated groundwater (Day 1 to Day 28).



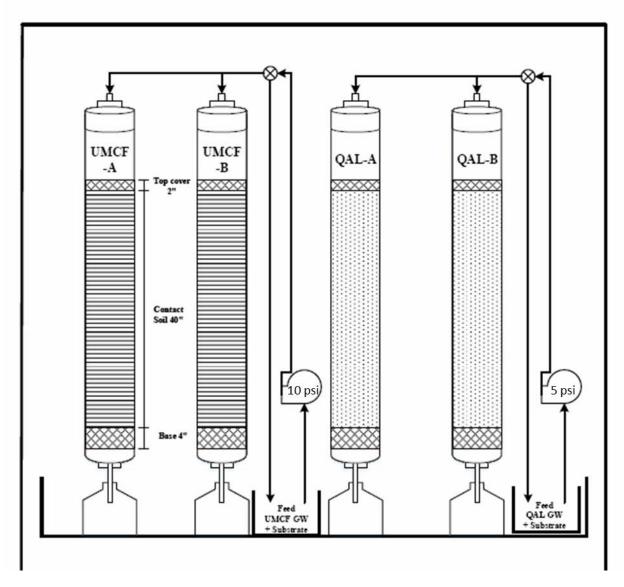


Figure 2.5: Schematic diagram of columns used for biological treatment of the QAL and UMCf groundwater after Day 28. The QAL columns were pressurized at 5 psi and UMCf was 10 psi. The QAL columns before Day 28 were gravity fed.

2.8 Microbial Analysis

On desired dates, about 30 mL of the microcosm content were transferred to autoclaved containers and shipped overnight to a commercial laboratory (Research and Testing Laboratories, Lubbock, Texas) for bacterial community analysis. The total number of bacteria, archaea, and Cr (VI) reducing bacteria were evaluated.

DNA from the microorganisms present was extracted using Illumina next-technology (Research and Testing, 2015) which utilizes clonal amplification and sequencing by synthesis. The first primer selected for the study was 515F-806R, which is specific for bacteria and archaea. For the chromium reducing bacteria, the primers were 27YMF and 534 R based on a previous study by Somenahally et al., 2013. Once the sequences were generated, the data were examined for the removal of short, singleton, noisy, and bad read sequences. The quality-checked sequences were clustered at a 4% divergence using USEARCH clustering algorithm (Research and Testing, 2015). The sequences obtained were identified using an in-house-maintained database that is derived from the National Center of Biotechnology Information (NCBI). The final results obtained include the percentages for each organism identified up to species level.

CHAPTER 3 SOIL AND GROUNDWATER CHARACTERIZATION

3.1 Soil Characterization

The soil characterization included grain size distribution and chemical contribution of the soil from the UFIW-02 well (Table 3.1). The moisture content in soil samples were $12.01 \pm 0.58\%$ in the QAL (25-28 feet), $50.88 \pm 3.40\%$ in the Intermediate (31-36 feet) interval and $42.26 \pm 3.55\%$ in UMCf (43-48 feet). The Intermediate sample was taken at a depth on the boundary between the QAL and UMCf. The QAL soil samples were visibly granular and dry, while the two lower depths—Intermediate and UMCf—were clayey with very high moisture.

Table 3.1 Grain Size Distribution and Contaminant Contribution from the Soil Samples at QAL (23-28 feet), Intermediate (31-36 feet), and UMCf (43-48 feet) depth

Wet Soil Sample at Various	Moisture	Ioisture Contaminant concentration in extracts		Size fractions (%)			
Depths	(%)	Moisture extraction	Rinsed- extraction	Sieve size (mm)	Percent retained		
100 mg			Chromium=	> 9.5	3.19		
Manage Ma			21 ± 8 μg/L	> 4.75	8.09		
	12 ±0.6	No liquid could	Nitrate= 10.380±	> 0.85	26.44		
	12 20.0	be collected	1.7 mg NO ₃ /L	> 0.425	11.06		
		Perchlorate =		> 0.075	43.96		
Depth:23 to 28 ft (QAL)			7.1215 ±1.7 mg/L	< 0.075	7.25		
		Chromium=	Chromium=	> 9.5	6.10		
Office agg of the office of		35 μg/L	= 17±10 μg/L	> 4.75	1.80		
A SECTION OF THE SECT	50 ±3	Nitrate= 1183	Nitrate= 140.304±	> 0.85	14.84		
		± 0.42 mg-NO ₃ /L	1.0 mg NO ₃ /L	> 0.425	11.47		
		Perchlorate =	Perchlorate =	> 0.075	45.51		
Depth:31 to 36 ft (Intermediate)		1333 ±14 mg/L	50.2101 ±1.1 mg/L	< 0.075	20.24		
		Chromium=	Chromium= 26	> 9.5 10			
Arra Arra		20 μg/L	±12.7 μg.L	> 4.75	0.00		
W. Sattles Land	42 . 4	Nitrate= 1182	Nitrate= 40.103±	> 0.85	8.00		
	42 ±4	mg-NO ₃ /L	2.9mg NO ₃ /L	> 0.425	3.98		
《果》 第一年第一	•	Perchlorate = 1282 ±37	Perchlorate =	> 0.075	42.30		
Depth:43 to 48 ft (UMCf)		mg/L	45.6394± 1.1 mg/L	< 0.075	35.70		

3.1.1 Grain Size Distribution of Soil

The grain size distributions of the soils from different depth intervals are shown in Table 3.1. The sieve analysis shows that the majority of the grains were of a size between 0.425 mm to 0.075 mm (>45%). The second highest percentages were: for QAL particles between 4.75 and 0.85 mm (26.44%), for Intermediate particles < 0.075 mm (20.24%), and for UMCf particles < 0.075 mm (35.70%).

3.1.2 Contaminant in the Groundwater Extracted from the Soil Samples (Moisture-Extraction)

An attempt was made to extract the groundwater (soil moisture) from soil samples. The Intermediate and UMCf yielded water and were analyzed for chromium, nitrate, and perchlorate. Table 3.1 shows the concentration of contaminants in the extracted liquid from the soil depths. No liquid could be extracted from QAL. Notice that the concentrations of the contaminants were similar to those measured in the groundwater from QAL (Figure 3.1 and Figure 3.2).

3.2 Contaminant Extraction by Soil Rinsing

3.2.1 Contaminant Extraction by Soil Rinsing for Soil from Well UFIW-02

Table 3.2 shows the amount of hexavalent chromium, perchlorate, and nitrate measured in the extracts from the various soil horizons in well UFIW-02. Chromium concentrations are twice as large in Intermediate and UMCf compared to QAL, showing greater Cr in the UMCf than in the QAL. Nitrate and perchlorate concentrations are very high and increase with depth.

Table 3.2: Amount of contaminants of concern in the soil at different depths

Soil Depth (ft)	Chromium hexavalent	Nitrate	Perchlorate	
	μg/kg dry soil	mg NO ₃ /kg dry soil	mg/kg dry soil	
QAL (23-28 feet)	150 ± 50	70.04 ±10.10	47.30 ±8	
Intermediate (31-36 feet)	240 ±140	552.69 ±12.25	688.49 ±16.77	
UMCf (43-48 feet)	300 ±140	466.44 ±31.63	530.85 ±15.78	

Note: The mass of contaminant in each extract was calculated by multiplying the concentration measured and the extract volume. The mass was then divided by the amount of dry soil (moisture content was also computed and was used to determine dry soil weight).

3.2.2 Contaminant Contribution by the Soil Samples in Soil Fractions (Rinsed-soil)

Table 3.3 shows the average amount of hexavalent chromium, perchlorate, and nitrate measured in the extracts from the mixed, sundried, and sieved soil. The contaminant concentration gradually increased with decrease in soil grain size for all contaminants in each horizon except for chromium. The chromium concentrations were similar (90-120 ppb) in all horizons except for soil grain size 0.075–0.425 mm (passing through #40 and retained on #200) in the 23-28 ft horizon. The concentration was significantly higher at 220 µg Cr/kg dry soil. Both nitrate and perchlorate were very high in the deeper soil intervals. It was expected that the contaminant concentration would increase with depth, but nitrate concentration was the highest in all soil fractions from at a depth of 31-36 ft rather than in the 43-48 ft samples. Perchlorate concentration increased with soil fraction for each soil horizon depth. The QAL soil had the lowest perchlorate concentration for finer soil, but the intermediate depth soil had the lowest perchlorate concentration for the coarser soil.

3.2.3 Contaminant Extraction by Soil Rinsing for Soil from Wells CTMW-03S and CTIW-01D

Table 3.4 shows the amount of hexavalent chromium, perchlorate, and nitrate measured in the extracts from the QAL (CTMW-03 S) and UMCf (CTIW-01D). Chromium and perchlorate concentrations were very high and increased with depth. Nitrate was almost double in the QAL soil as compared to the UMCf.

Table 3.3: Average amount of contaminants of concern in the soil at different depths

Call Daniel (G)	Chromium (µg/kg dry soil)			Nitrate (mg NO ₃ /kg dry soil)			Perchlorate (mg/kg dry soil)		
Soil Depth(ft) Soil fraction	QAL (23-28 feet)	Intermediate (31-36 feet)	UMCf (43- 48 feet)	QAL (23-28 feet)	Intermediate (31-36 feet)	UMCf (43-48 feet)	QAL (23-28 feet)	Intermediate (31-36 feet)	UMCf (43- 48 feet)
passing #20; remaining #40 (grain size: 0.425 mm)	120	90 ±0.02	130	60.1 ± 0.99	470.1	373.7	48.8 ± 0.30	28.2 ± 2.57	365.1 ± 3.81
passing #40; remaining #200 (grain size: 0.075 mm)	220 ±0.21	110	110 ±0.03	66.8	529.8	407.6 ± 0.03	51.80± 2.97	322.30 ± 2.09	396 ± 1.145
passing #200 (grain size: < 0.075 mm)	90 ±0.02	100	120 ±0.02	72.6	752.4	536.9	56.5 ± 0.78	444.7 ± 4.47	530.5 ± 1.91

Table 3.4: Amount of contaminants of concern in the soil

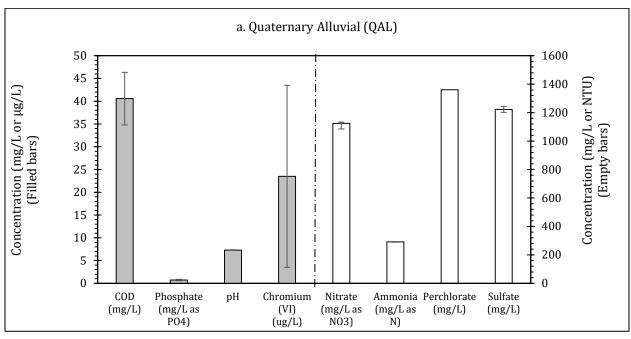
		Cr (VI)		Nitrate		Perchlorate	
Soil Depth (ft)	Average± s	tandard deviation	Average± standard deviation Average± standard dev			± standard deviation	
	μg/L	μg/kg dry soil	mg/L	mg/L mg NO ₃ /kg dry soil		mg/kg dry soil	
CTMW 03S, QAL (18.3 to 23 ft)	6.08± 0.13	38.1 ± 0.9	18± 0.5	112.67±0.9	37 ±2.7	232.41 ±16.4	
CTIW 01D, UMCf (33.5 to 38.5 ft)	1271 ± 114	5378±47	16 ± 0.5	69.38±1.5	71 ±1.4	302.41±8.5	

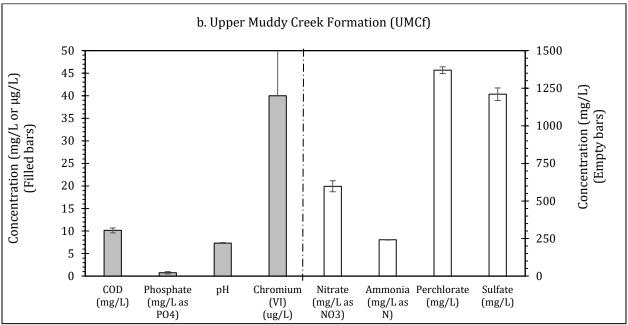
3.3 Groundwater Characterization

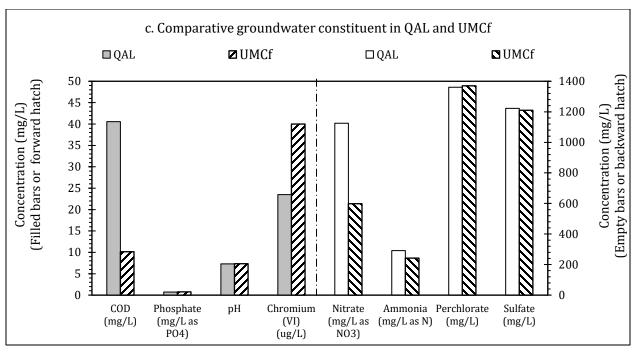
Groundwater from Well UFIW-06 Collected 7/22/2016

The groundwater obtained from the site on 7/22/2016 from well UFIW-06 was analyzed immediately upon arrival. The average concentrations of contaminants measured in four bottles from the quaternary alluvial layer (25-30 ft bgs), QAL, and UMCf (35-40 ft bgs) are presented in Figure 3.1 (a), and Figure 3.1 (b), respectively. The pH levels of both waters are around the neutral range. Each groundwater bottle showed different turbidity—likely due to the lack of sufficient water yielded in the well. The chemical oxygen demand (COD)—a measure of the presence of organic compounds—is higher in the QAL (40 mg/L) as compared to the UMCf (10 mg/L). Nitrate concentrations are very high, varying from 135 mg N/L (597 mg-NO₃/L) in QAL to 250 mg N/L (1,106 mg-NO₃/L) in the UMCf. Perchlorate concentrations in both horizons are extremely high and above 1,300 mg/L. Sulfate levels in both horizons are similar and around 1200 mg/L. Ammonium levels are high in both horizons varying from 240-250 mg-N/L. This is unusual since in the lower areas of NERT ammonium has been converted to nitrate, unlike this area. It is advisable to check the in-situ concentrations of oxygen in these wells given the very high ammonium concentrations. Phosphate levels are very small and below 1 mg/L.

The Cr (VI), COD, and turbidity in each bottle is shown in Figure 3.2. Turbidity varied in each sampling bottle. At the QAL, turbidity was between 600-1200 NTU while at UMCf it was much lower (4-12 NTU). This shows that the fine-grained material from the QAL is easily carried away by water—as was also found when we studied soil flushing in other areas of NERT. Cr (VI) also varied in each sampling bottle from 10 to 60 μ g/L in QAL and 10 to 70 μ g/L in UMCf. The bottles were labelled as they were filled in the field. It was suspected that upon each drawing the Cr (VI) was different. However, groundwater from both horizons contained low Cr (VI) concentrations, below 80 μ g/L. It was suspected that COD might also vary in the sampling bottles, but the COD measurements were between 37.4 to 38.7 mg/L in QAL and 8 to 11.6 mg/L in UMCf groundwater.







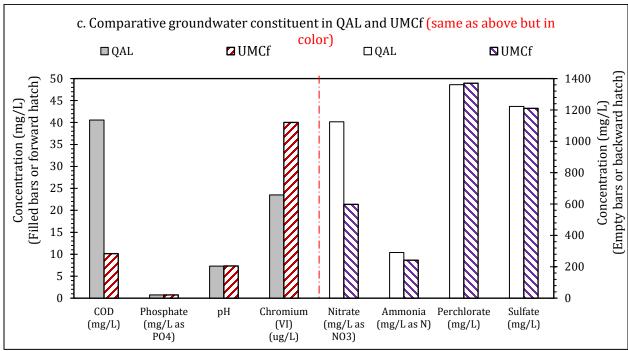


Figure 3.1: Groundwater characterization in quaternary alluvial layer (25-30 ft) (a), muddy creek formation (35-40 ft) (b) groundwater from UFIW-06 received on 7/22/2016 and comparison of QAL and UMCf groundwater (c). The contaminants concentrations for the filled and with forward hatched bars (left of the vertical dotted line) are read on the left y-axis and for the filled and with backward hatched bars (right of the vertical dotted line) are read on the right y-axis.

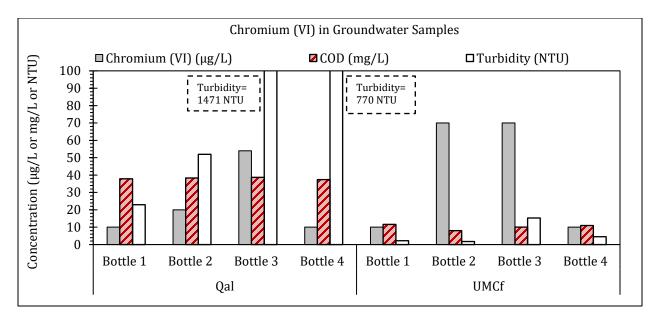
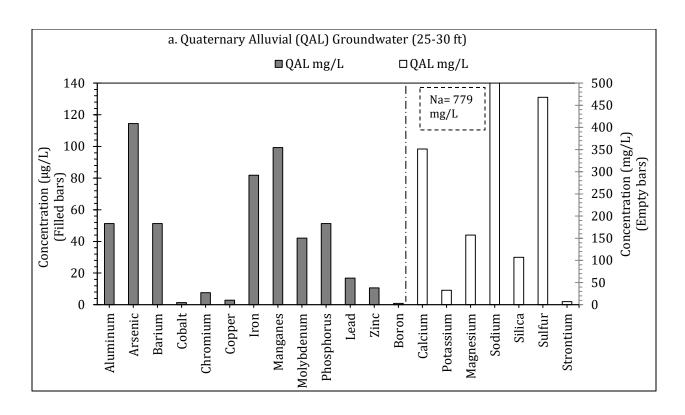
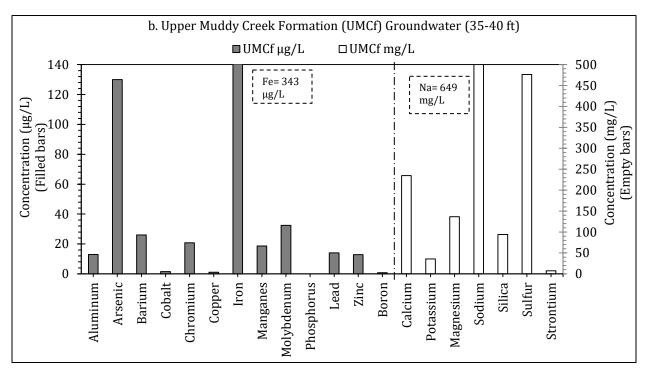


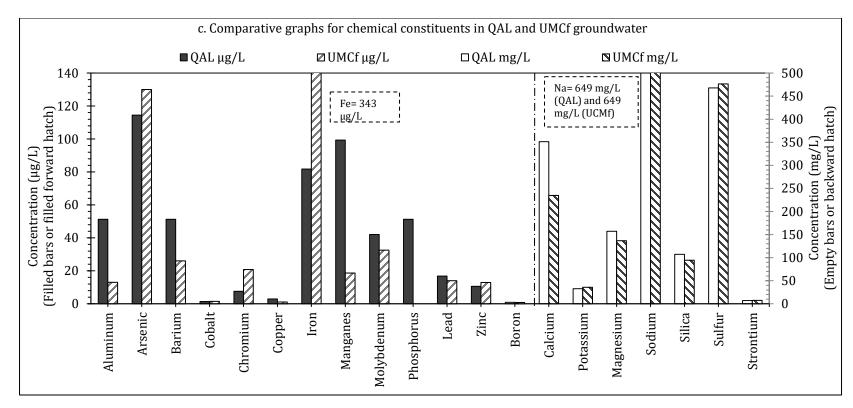
Figure 3.2: Hexavalent chromium, COD and Turbidity varied in each groundwater sample from UFIW-06 received on 7/22/2016 from both depths.

Note: Units of each contaminant are different and are specified in the legend. Bottles were numbered according to the filling at the site.

Total metal analysis for the groundwater is shown in Figure 3.3. Metal and elemental analysis indicated high concentrations of arsenic (100 μ g/L), calcium (351.3 mg/L), sodium (779 mg/L), and sulfur (468 mg/L) in QAL groundwater. In UMCf groundwater, the concentrations of key analytes included arsenic (130 μ g/L), iron (343 mg/L), sodium (649 mg/L), and sulfur (476 mg/L). The arsenic concentration in both waters is much greater than that of chromium.







Below is same graph in color.

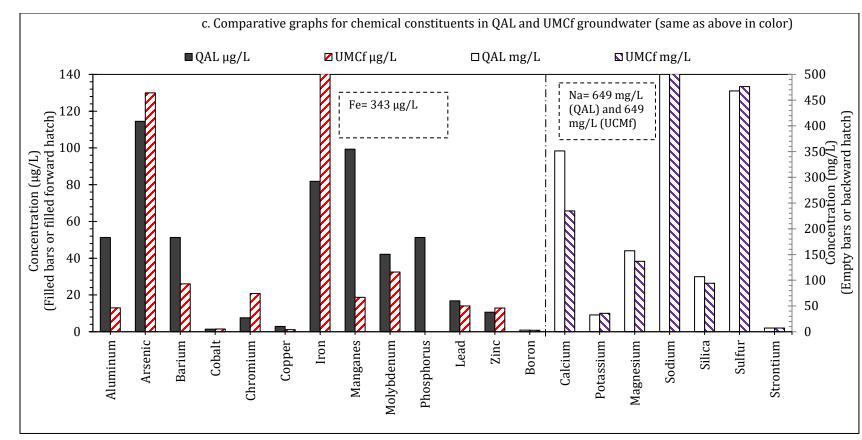
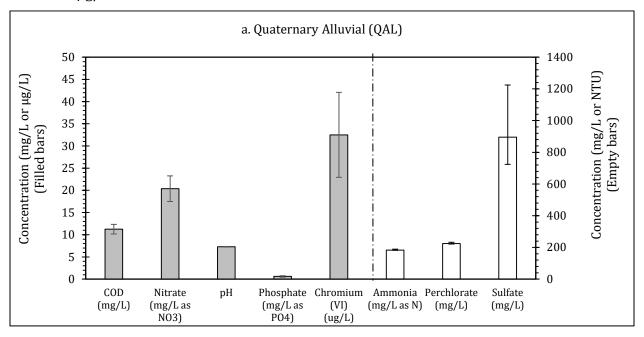


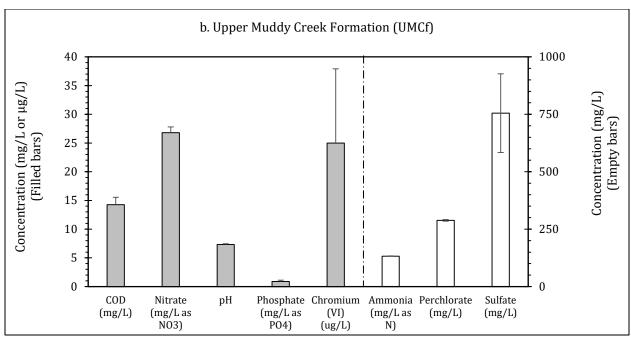
Figure 3.3: Total metal analysis in the groundwater sample from UFIW-06 received on 7/22/2016.

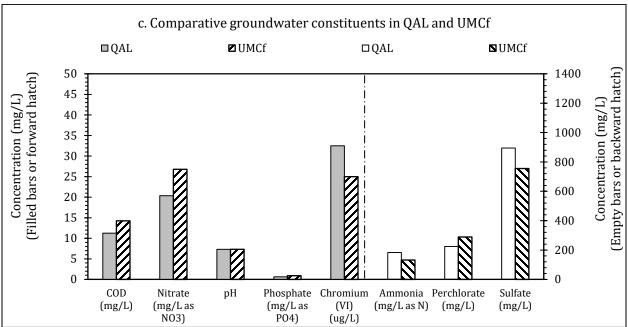
Groundwater from Well UFIW-03 Collected 8/26/2016

Groundwater collected from the site on 8/26/2016 from well UFIW-03 was analyzed immediately upon arrival. The groundwater from each field collection bottle was carefully transfered into storage bottles to ensure no resuspension of the settled solids and prevent clogging of the columns. The average concentrations of contaminants measured in four bottles each from QAL depth and UMCf depth are presented in Figure 3.4 (a) and Figure 3.4 (b), respectively. The pH readings of both waters are around 7.3. The standard deviation for each contaminant measurement is shown in the bar graphs of Figure 3.4.

COD, nitrate as NO₃, perchlorate, phosphate, and sulfate measured in the groundwaters of QAL and UMCf were comparable. COD in groundwater from both depths were below 15 mg/L. Nitrate was about 20 mg NO₃/L and perchlorate was around 250 mg/L. The Cr (VI) varied from 20 to 40 μ g/L in QAL and 10 to 40 μ g/L in UMCf groundwater. Groundwater from both horizons contained low Cr (VI) concentrations, below 40 μ g/L.







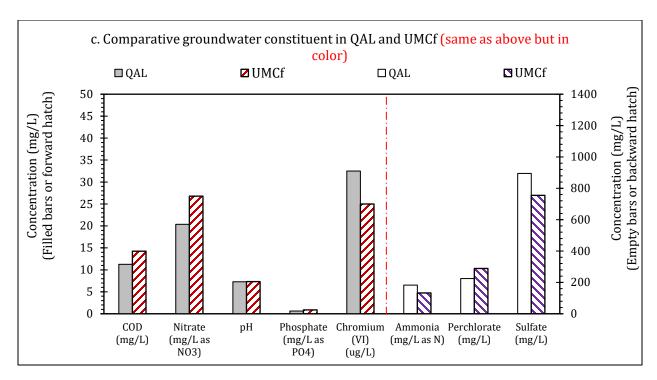


Figure 3.4: Groundwater from UFIW-03 received on 8/26/2016 for characterization in quaternary alluvial layer, QAL (25-30 ft) (a), muddy creek formation, UMCf (35-40 ft) (b), and comparison between QAL and UMCf (c).

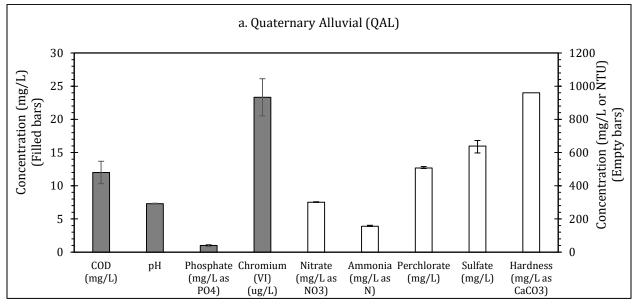
Note: The contaminants concentrations for the filled and with forward hatched bars (left of the vertical dotted line) are read on the left y-axis, and for the filled and with backward hatched bars (right of the vertical dotted line) are read on the right y-axis in Figure 3.4 c.

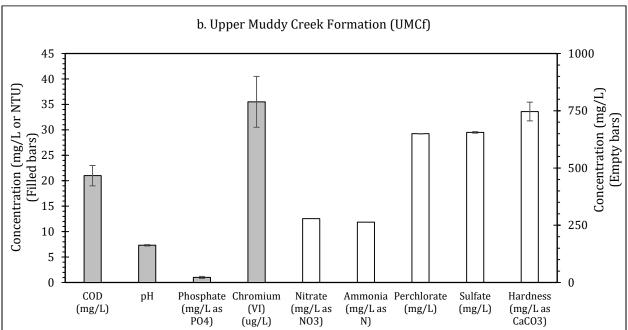
Groundwater from Well UFIW-06 Collected 11/22/2016

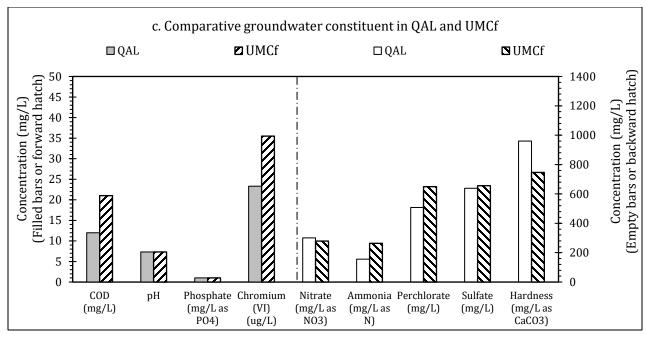
Groundwater collected from the site on 11/22/2016 from UFIW-06S and UFIW-06I were carefully transfered into two clean, labelled buckets to ensure no resuspension of the settled solids. All the bottles with QAL groundwater were mixed in one bucket and all UMCf groundwater bottles were mixed in another bucket. The concentrations of contaminants measured from the mixed QAL groundwater (25-30 ft bgs) and UMCf (35-40 ft bgs) are presented in Figure 3.5 (a) and Figure 3.5 (b), respectively. The pH measurements of both waters are around the neutral range. The standard deviation for each contaminant measurement is shown in the bar graphs of Figure 3.5. Figure 3.5 (c) shows the comparison of constituents in the QAL and UMCf groundwater.

All the contaminant levels of concern (COD, nitrate as NO₃, Cr (VI), perchlorate, phosphate, and sulfate) were comparable between the QAL and UMCf groundwaters. COD

in groundwater from both depths were below 25 mg/L. Nitrate was about 270-300 mg NO $_3$ /L and perchlorate was around 500-600 mg/L. The Cr (VI) in both groundwaters was below 40 μ g/L.







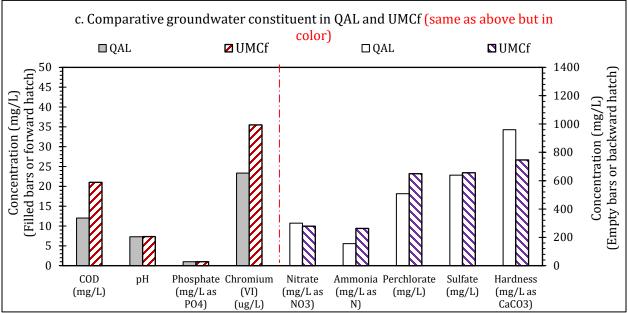


Figure 3.5: Groundwater from UFIW-03 received on 11/22/2016 for characterization in quaternary alluvial layer, QAL (25-30 ft) (a), muddy creek formation, UMCf (35-40 ft) (b), and comparison between QAL and UMCf (c)

Note: The contaminants concentrations for the filled and with forward hatched bars (left of the vertical dotted line) are read on the left y-axis, and for the filled and with backward hatched bars (right of the vertical dotted line) are read on the right y-axis in Figure 3.6 (c).

Groundwaters from Wells CTMW-03 and CTIW-01 Collected 12/07/2017

Groundwaters CTMW-03S (QAL) and CTIW-01D (UMCf) were obtained on 12/07/2017. The QAL groundwaters in four bottles were mixed and stored; the UMCf groundwater in four bottles were also mixed and stored. The results of the groundwater analyses performed on the mixed QAL and mixed UMCf groundwater are shown in Figure 3.6.

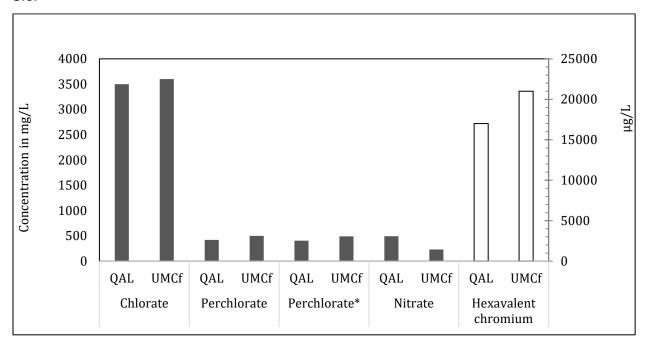


Figure 3.6: Characteristics of mixed QAL (CTMW 03 well) and UMCf (CTIW 01D) groundwater. *Perchlorate measured at Silver State Laboratory, NV.

Figure 3.7 shows the quality of CTIW 01S (QAL), CTIW 01D (UMCf), CTMW 03S (QAL), and CTMW 03D (UMCf) groundwater as provided by the Tetra Tech. The chlorate concentration was about 3450 mg/L, perchlorate about 620 mg/L, and Cr (VI) about 16500 μ g/L in the QAL groundwater. The UMCf groundwater contained higher concentrations of chlorate at about 3800 mg/L, higher perchlorate at about 840 mg/L and higher Cr (VI) at about 18000 μ g/L.

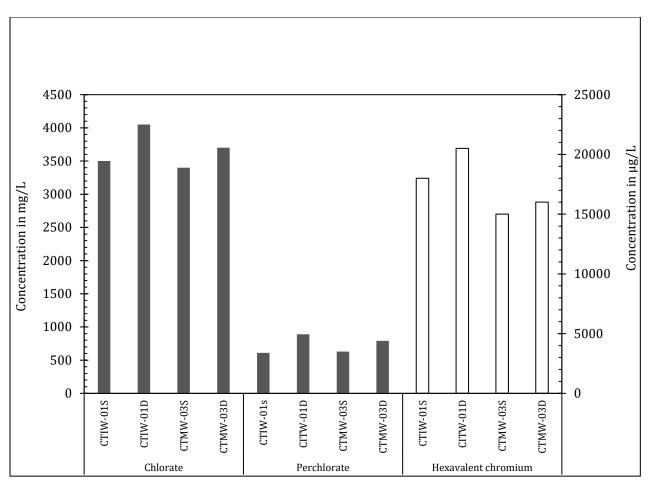


Figure 3.7: Groundwater from well CTIW 01D, CTIW 01S, CTMW 03, and CTMW 03D analysis obtained from Tetratech

CHAPTER 4 RESULTS AND DISCUSSIONS OF CHEMICAL REDUCTION

4.1. Batch Testing for Chemical Reduction of Cr (VI)

Six sets of secondary batch tests were conducted with each set comprising of six beakers. QAL and UMCf groundwaters were spiked with Cr (VI) for high (10,000 μ g Cr⁺⁶/L) and low (500 μ g Cr⁺⁶/L) concentrations testing. The batch testing was conducted with varying ratios from 1.5X to 5X times the stoichiometric requirement for CaSx and 5X to 50X times the stoichiometric requirement for ferrous sulfate. The testing matrix is shown in Table 2.3 in section 2.4.3 and further information can be found in Appendix C.

4.1.1 High Chromium Concentration Test

Tables 4.1 and 4.2 summarize the results of batch tests using CaSx and ferrous sulfate for removal of high concentration (\sim 10,000 ppb) Cr (VI) in the groundwater. Chromium removal was >99% for groundwater of both sample depths (i.e. QAL and UMCf) when CaSx was used. All final Cr (VI) concentrations were <100 μg/L. For groundwater from both intervals, Cr (VI) concentration below 10 µg/L was obtained for 2X CaSx. Additional CaSx up to 5X did not promote higher removals. Indeed, observed removals were lower for 3X-5X than for 2X stoichiometric ratios. This unexpected result may be associated with color interference with the Cr (VI) analysis method used. As more CaSx is added, a yellow hue (due to hydrogen sulfide generation) is imparted to the water. An organe/red rust hue is also seen in samples as more ferrous sulfate is added to the water. Given the interference with Cr (VI) analysis using the Hach Method—where the color formed after adding the powder pillow was different from that expected—dissolved chromium concentrations were then measured by inductively coupled plasma (ICP). In addition, diluting the groundwater by 100X resolved the color issue during the test. The total dissolved chromium concentrations were measured in batch samples that were settled for 10 minutes, but not filtered. Samples with fewer entrained solids and sorbed/precipitated Cr (i.e. less turbidity) will exhibit lower chromium concentrations than those with higer sample turbidity. Therefore, when samples were turbid after settling they were then digested with acid prior to analysis by ICP.

Turbidity data in Tables 4.1 and 4.2 are turbidity values after settling for 10 minutes (Pictures in Appendix F). Larger sludge volume was observed with ferrous sulfate than with CaSx (e.g. in 250 mL of high chromium concentration groundwater < 1 mL with CaSx and < 3 mL with ferrous sulfate; for low chromium concentrations both coagulants generated low solids volumes (< 1 mL). The turbidity data also show that CaSx-generated solids settled more quickly than those from use of ferrous sulfate.

The pH values for the groundwater after coagulant treatment varied from 7.78 to 8.26 (CaSx) and 5.9 to 8.1 (ferrous sulfate). This difference in pH is expected given the caustic nature of CaSx and the acidic nature of ferrous sulfate. Notwithstanding, the final pH values obtained are within discharge standards (i.e. pH of 6-9) and are largely influenced by the high buffering capacity of the NERT groundwater.

Similar to CaSx, the use of ferrous sulfate resulted in > 99% removal of Cr (VI). However, at least 5X the stoichiometric ratio of ferrous sulfate are needed as compared to 2X for CaSx. Final chromium levels < $10~\mu g$ Cr⁺⁶/L were not achieved with ferrous sulfate (Table 4.2). However, lower turbidity groundwater is obtained with the use of ferrous sulfate.

Table 4.1: Batch Precipitation Test for High Chromium Concentration in 250 mL groundwater using various stoichiometric ratios of calcium polysulfide (CaSx) (27% by wt)

Calcium Polysulfide (CaSx) (27% by wt)

Groundwater from

Selected ratio times the stoichio.	Volume of CaSx added to the groundwater			QAL, 25- 30 concentratio Cr+6		UMCf, 35-40 concentratio Cr+6/	n 9800 μg		
(1.5 moles CaSx/moles Cr+6)	mL of CaSx per 1000 L groundwater	Final µg Cr +6/L	% removal	Turbidity NTU	Total dissolved Chromium µg/L	Final µg Cr +6/L	% removal	Turbidity NTU	Total dissolved Chromium mg/L
1.5X	253	70	99.33	246	9260	20	99.80	256	8740
1.5X	253	90	99.14	251	9160	10	99.95	284	8770
2X	337	10	99.90	174	4190	10	99.95	201	7910
2X	337	10	99.86	181	4680	10	99.90	216	8600
3X	505	50	99.52	153	770	10	99.90	178	1030
3X	505	60	99.42	170	1640	30	99.69	222	750
4X	673	40	99.62	160	830	20	99.80	217	730
5X	842	70	99.33	146	860	20	99.80	284	820
5X	842	50	99.52	159	970	30	99.69	200	560

Table 4.2: Batch Precipitation Test for High Chromium Concentration in 250 mL groundwater using various stoichiometric ratios of ferrous sulfate (6%)

Ferrous Sul	Groundwater from								
Selected ratio times the	Volume of FeSO ₄ added to the groundwater		QAL, 25- 30 ft (initial concentration 10500 μg Cr+6/L)						oft (initial on 9.8 mg /L)
stoichio. (3 moles Fe/mole Cr+6)	mL of FeSO ₄ per 1000 L groundwater	Final µg Cr +6/L	% removal	Turbidity NTU	Total dissolved Chromium µg/L	Final µg Cr +6/L	% removal	Turbidity NTU	Total dissolved Chromium µg/L
5X	2236	60	99.43	154	9280	20	99.80	216	8620
5X	2236	70	99.33	148	9310	30	99.69	231	8490
10X	4472	30	99.71	166	310	40	99.59	287	2670
20X	8945	190	98.19	103	270	50	99.49	28	90
20X	8945	160	98.48	111	320	30	99.69	31	80
30X	13417	100	99.05	93	140	30	99.69	139	260
50X	22361	60	99.43	70	150	45	99.54	87	112
50X	22361	45	99.57	66	160	20	99.80	79	110

To determine the impact of CaSx and ferrous sulfate on the removal of nitrate and perchlorate—which were also present in the groundwater—the settled waters from the batch tests were analyzed for these contaminants (Tables C7 and C8 in Appendix C). As expected, the use of the coagulants had no impact on nitrate and perchlorate concentrations.

4.1.2 Effect of Solids in Groundwater

The batch tests were repeated to evaluate the impact of suspended solids addition on the hexavalent chromium removal in QAL using CaSx and in UMCf using ferrous sulfate (Table 4.3). For five times (5X) the stoichiometric ratio, Cr (VI) concentration was lowered to 20 μ g/L on average when solids were added to the QAL groundwater to aid coagulation. However, statistical analysis of the Cr (VI) concentrations with and without addition of solids showed that, overall, there is no signicant difference in chromium removal when solids are added (p> 0.05). For ferrous sulfate (Table 4.4), the addition of solids had a significant impact on Cr (VI) removal from the UMCf groundwater (p< 0.05). However, both CaSx and ferrous sulfate addition did not generate an effluent with < 10 μ g Cr ⁺⁶/L. CaSx at stoichiometric ratio two (2X) yielded in effluent Cr (VI) greater or equal to 10 μ g Cr ⁺⁶/L in QAL water, as shown in Table 4.1.

The volume and weight of solids formed in the batch tests (i.e. the sludge) are shown in Tables 4.3 and 4.4. The pictures of the settling test are shown in Appendix F. Ferrous sulfate precipitation resulted in a greater volume of sludge compared to CaSx. The volume of sludge formed by CaSx was harder to measure because the sludge did not settle as quickly. For solids measurements, all the batch test contents were centrifuged for 10 minutes at 3000 rpm and the settled sludge was transferred to aluminum dishes to measure its weight. The weights of the settled sludges are shown in Table 4.3. A small portion of CaSx sludge was lost while transferring from graduated cylinder to a centrifuge bottle and then to aluminum dishes after centrifuging.

Table 4.3: Batch Precipitation Test for High Chromium Concentration in 250 mL groundwater from 25-30 ft (initial concentration= $10500 \mu g Cr^{+6}/L$) using various stoichiometric ratios of calcium polysulfide (CaSx, 27%) to Evaluate the Effect of Solids on Chromium Removal

Calcium Polysulfide in Groundwater from QAL, 25- 30 ft with initial concentration 10500 ug Cr⁺⁶/L

		– Solids					
Groundwater treatment for Jar test	Selected ratio times the stoichiometric			Final Hexava	301143		
jui test	ratio (1.5 moles CaSx/moles Cr ⁺⁶)	mL of CaSx per 1000 L groundwater	μg Cr+6/L	% removal	Total Chromium μg/L	Volume (mL)	weight (g)
	5X	842	50	99.52	8920	<1	0.0237
filtered through coffee filter	5X	842	60	99.42	8760	<2	0.0201
	10X	1682	1080	89.71	8670	<3	0.03
1 g soil added to	5X	844	20	99.81	5740	4	0.2756
the filtered	5X	844	30	99.71	6230	4	0.2212
groundwater	10X	1682	440	95.81	5250	4	0.2559

Note: The batches were operated with 250 mL groundwater and solids were added at 1g/L (ie. 0.25 g/250 mL groundwater).

The volume of sludge was recorded after 10 minutes settling.

Table 4.4: Batch Precipitation Test for High Chromium Concentration in 250 mL groundwater from 35-40 ft(initial concentration= 9800 μ g Cr⁺⁶/L) using various stoichiometric ratios of Ferrous Sulfate (6%) to Evaluate the Effect of Solids on Chromium Removal

Ferrous Sulfate in Groundwater from UMCf, 35-40 ft with

	initial cond	- C.P.I.					
Groundwater treatment for	Selected ratio times	Volume of FeSO ₄ added to the groundwater		Final Hexav	Solids		
Jar test	the stoichio. (3 moles Fe/mole Cr+6)	mL of FeSO ₄ (6%) per 1000 L groundwater	μg Cr/L	% removal	Total Chromium μg/L	Volume (mL)	weight (g)
Groundwater	5X	2236	90	99.69	7720	1	0.0247
filtered samples with coffee filter	5X	2236	80	99.80	7470	1	0.0154
(20 μm pores)	10X	4472	50	99.80	4660	4	0.0355
1 g soil added to	5X	2236	20	99.80	4810	5	0.2851
the groundwater filtered samples with coffee filter	5X	2236	20	99.80	3740	5	0.2608
	10X	4472	40	99.69	2390	6	0.2925

Note: The batches were operated with 250 mL groundwater and solids were added at 1g/L (ie. 0.25 g/250 mL groundwater). The volume of sludge was recorded after 10 minutes settling.

4.1.3 Low Chromium Concentration Test

Table 4.5 and Table 4.6 summarize the results of coagulant treatments (i.e. CaSx and ferrous sulfate) on low chromium concentrations in NERT groundwater. None of the multiples of the calculated stoichiometric ratio resulted in <10 μ g Cr⁺⁶/L despite high % mass removals from 88-93%. As expected, total dissolved chromium concentrations measured by inductively coupled plasma (ICP) were higher than the values of Cr (VI) measured by the Hach Method. The total dissolved chromium samples were measured in unfiltered samples by ICP.

During the research, it was found that the QAL groundwater contained some substance that interferes with chromium measurements using the Hach Method. The method gave different readings for duplicate analyses of low level samples. This interference was confirmed by a QA/QC. As explained in Appendix A (Table A3), the Cr (VI) analysis with Hach kits for QAL always required dilution (preferably 100 times) to get correct readings. For these low concentration QAL batches, the final Cr (VI) readings are reported in Table 4.5 and Table 4.6 for CaSx and ferrous sulfate, respectively, with a dilution of 2 times. The samples for these batches were analyzed with a dilution of 100, 50, 10 and 2, and only the dilution by 2 resulted in readable data. Hach kits have detection limit of $10 \, \mu g/L$, so a dilution of 100 times could not be used at all times. Therefore, the samples were analyzed with a dilution at least of 2 times. For UMCf, it was suspected that lack of solids resulted in poor Cr (VI) removal in CaSx batches. Soil was not added to any of the UMCf batches.

The sludge formed by CaSx did not settle well for these tests. The sludge formed by ferrous sulfate was fluffier, but settled comparatively faster. Therefore, the total dissolved chromium concentrations in batches with ferrous sulfate were comparatively lower in QAL. An average total dissolved chromium concentration of 436 μ g/L in UMCf was not expected. It was suspected that this finding is due to lack of solids in the groundwater. In summary, removal of chromium from the NERT groundwater by precipitation with CaSX and ferrous sulfate is more effective for higher concentrations than for lower chromium

concentrations. The lack of suspended solids in the UMCf groundwater makes precipitation less effective by either coagulant.

Table 4.5: Batch Precipitation Test for Low Chromium Concentration in 500 mL groundwater using various stoichiometric ratios of calcium polysulfide (CaSx) (27% by wt)

Calcium Polysulfide (Raw CaSx= 27%) Groundwater from Volume added to the QAL, 25-30 ft (initial concentration 520 UMCf, 35-40 ft (initial concentration 550 **Selected ratio** times the groundwater $\mu g Cr + 6/L)$ μg Cr+6/L) stoichiometric **Total dissolved** mL of CaSx per 1000 L % Final % **Total dissolved Final** ratio (1.5 moles Chromium groundwater μg Cr +6/L μg Cr +6/L Chromium µg/L removal removal CaSx/moles Cr+6) μg/L 34.55 470 17 60 88.46 430 360 2X 17 40 92.31 52.73 2X 440 260 460 88.46 70.91 26 60 410 460 160 3X 26 92.31 67.27 40 460 3X 410 180 43 92.31 40 400 80 85.45 460 5X 43 60 88.46 450 5X 400 80 85.45

Table 4.6: Batch Precipitation Test for Low Chromium Concentration in 500 mL groundwater using various stoichiometric ratios of ferrous sulfate (6%)

Ferrous Sulf	Groundwater from						
Selected ratio times	Volume added to QAL, 25-30 the groundwater		t (initial con Cr+6/L)	UMCf, 35-40 ft (initial concentration 550 μg Cr ⁺⁶ /L)			
the stoichio. (3 moles Fe/mole Cr+6)	mL of FeSO ₄ per 1000 L groundwater	Final µg Cr +6/L	% removal	Total Chromium μg/L	Final mg Cr +6/L	% removal	Total dissolved Chromium µg/L
10X	515	40	92.73	220	40	92.31	450
10X	515	60	89.09	230	40	92.31	450
25X	1278	100	81.82	180	40	92.31	430
25X	1278	40	92.73	220	20	96.15	440
50X	2575	60	89.09	160	40	92.31	420
50X	2575	20	96.36	170	40	92.31	430

After the batch tests were completed, the beakers and the blade of the stirrers were checked for possible scale formation. It was confirmed by visual inspection that no scaling occurred in both high and low concentration tests. The pictures of the stirrers are shown in Appendix F.

4.2 Chemical Coagulation Using Columns

Table 4.7 shows the statistical analysis of percent removal of Cr (VI) in three columns using CaSx. Two columns were fed with low-chromium concentration groundwater (1000 μ g Cr⁺⁶/L), one column packed with QAL soil (QAL column) and the other with UMCf soil (UMCf A column). A third column, packed with UMCf soil, was fed with high-chromium groundwater (10,000 μ g Cr⁺⁶/L) (UMCf B column). In the low concentration columns, 20X stoichiometric was used and fourty times (40X) was used for columns with high concentration chromium.

For both Cr (VI) and total dissolved chromium, removals were excellent and mostly about > 99%. In the first day, Cr (VI) removal in the QAL column was 56.66% and increased to 93% on the third day. The average removal, excluding the first day, was $95.6 \pm 3.8\%$. The first day hexavalent chromium removal in UMCf A column was 5.55%, the second day the removal was 42.85%, and removal increased to 71.43% on the third day. The average removal excluding the first two days was 86.32 ± 8.0%. Comparing the QAL and UMCf A columns, QAL performed better than UMCf A. No cracks were observed in the soil of UMCf A column using visual inspection. The average removal shows that UMCf B performed better than the other two columns. In UMCf B, Day 1 Cr (VI) removal was 2.06%, 55.10% on the second day and increased to 99.8% on the third day. The average removal excluding the first two days was 99.51± 0.26%. The higher removal in UMCf B column is associated with the larger amount of calcium polysulfide used (40X the stoichiometric requirement) compared to the QAL and UMCf A (20X the stoichiometric requirement). Increasing the amount of CaSx to 40X stoichiometric had no major impact on Cr (VI) removal in the UMCf. Therefore, the addition of 20X stoichiometric of CaSx is sufficient to remove chromium from NERT groundwater.

Table 4.7: Statistical analysis of percent Cr removal in the columns for composite and grab samples.

Removal (%)

•	Hexava	alent Cr in grab	samples	Total Dissolved Cr in composite samples			
	Low Cr (VI) Columns		High Cr (VI) column	Low Cr (VI) Columns		High Cr (VI) column	
	QAL	UMCf A	UMCf B	QAL	UMCf A	UMCf B	
Average	95.6 ± 3.8	86.32 ± 8.0	99.51± 0.26	99.27± 1.08	95.95±7.34	99.90 ± 0.20	
Minimum	83.33	66.66	98.83	95.13	79.60	99.15	
Maximum	100	95.00	99.80	99.89	99.87	100	

Note: The statistical analysis ignored the first day in QAL 1000 $\mu g/L$ and the first two days in the UMCf columns when the removal was below 60% in the columns.

Table 4.8 shows the percent frequencies of Cr concentration in the column effluents falling within selected ranges for low Cr concentration columns (QAL, and UMCf A) and for high Cr concentration column (UMCf B) during the injection period. In the QAL column, for most of the time (43.5%), the effluent Cr (VI) concentration was within range 50-100 μ g/L. The Cr (VI), for about 30.4% of the time, was within 0 to 10 μ g/L. For UMCf A, the effluent Cr (VI) concentration was within the range 50-100 μ g/L for 43.5%; but for rest of the time, the concentration was above 100 μ g/L. For UMCf B, most of the time (34.8%) the effluent Cr (VI) was within the 0-40 μ g/L range and 30.4% of the time was within 50 to 100 μ g/L. The frequency for the UMCf B column within the lowest concentration range, 20-30 μ g/L, was 26.1%.

Table 4.8: Effluent concentration distribution for QAL, UMCf A, and UMCf B columns

Composituation	% Frequency					
Concentration	Low Cr	·(VI) Columns	High Cr (VI) column			
range μg/L -	QAL	UMCf A	UMCf B			
0 to 10	30.4	0.0	0.0			
10 to 20	26.1	0.0	0.0			
20 to 30	0.0	0.0	26.1			
30 to 40	0.0	0.0	34.8			
40 to 50	8.7	0.0	0.0			
50-100	43.5	43.5	30.4			
100-200	17.4	21.7	0.0			
400-1000	4.3	8.7	0.0			
>1000	0.0	0.0	8.7			

The performance of each column is detailed below.

4.2.1 Low Concentration Column Test

Figure 4.1 and Figure 4.2 show the effluent concentration of Cr (VI) in grab samples from the QAL and UMCf A columns over the operating period, respectively. Day 1 in each figure represents the first day when calcium polysulfide was injected. The data before CaSx injection is presented in Appendix D. The QAL and UMCf columns were fed 2X the stoichiometry for low Cr (VI), with a factor of safety of ten times—ie. effective ratio of 20X—considering poor mixing in soil.

The effluent Cr (VI) in QAL column on Day 2 was below 200 μ g/L and 100 μ g/L by Day 3 (Figure 4.1). The effluent Cr (VI) increased to 150 μ g/L on Day 5, decreased below 100 μ g/L on Day 6, and again increased on Day 8. The Cr (VI) fluctuated until Day 13, but remained below 200 μ g/L. After Day 13, the chromium concentration remained below 100 μ g/L even after stopping the calcium polysulfide on Day 31. The only exception was Day 21 when the concentration increased to 200 μ g/L for an unknown reason. The data suggest that a reserve of CaSx built up in the column pores and continued to remove Cr from solution several days after stopping CaSx injection. The influent Cr concentration was increased to 10000 μ g/L on Day 37 to test for breakthrough and to gauge the impact of residual CaSx in the column. Breakthrough was observed on Day 46, with effluent concentration exceeding 250 μ g/L—fifteen days after the CaSx feed had been stopped.

The effluent hexavalent chromium in the UMCf A column on Day 2 was below 400 μ g/L and continued to decrease to 50 μ g/L on Day 5 (Figure 4.2). The effluent chromium concentration increased to 200 μ g/L on Day 6. The Cr (VI) fluctuated but remained below 150 μ g/L even after stopping the CaSx on Day 18. The influent Cr concentration was increased to 10000 μ g/L on Day 30 and the column broke through exceeding 500 μ g/L on Day 37.

Figure 4.3 compares effluent Cr (VI) in QAL (Days 1 to 30) and UMCf A (Days 1 to 17) columns during the CaSx injection period only. The effluent Cr (VI) concentrations in QAL column were numerically lower than that of UMCf A column. However, there is no significant statistical difference (p> 0.05) between the effluent Cr (VI) concentrations of

both columns during the injection period. Therefore, injection of CaSx can be used at NERT to remove chromium from both QAL and UMCf groundwater. The better performance of the QAL column on some days might be because CaSx injection in QAL was performed twice a day while UMCf-A was injected once a day. The different injection mode was needed because of the higher flowrate of QAL column as compared to UMCf.

In the column injection ports, a white precipitate formed (Picture shown in Appendix F) which is likely a calcium carbonate precipitate given the NERT groundwater already

exhibits high concentrations of calcium and alkalinity.

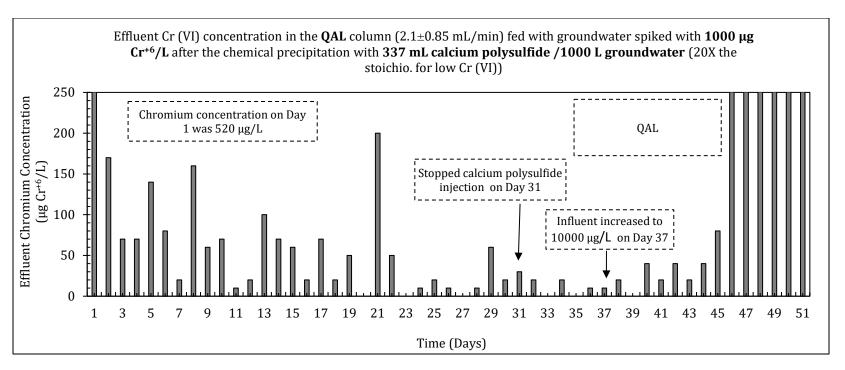


Figure 4.1: Effluent Cr (VI) concentrations in grab samples in the QAL A column after chemical precipitation of chromium with calcium polysulfide. (Calcium polysulfide was stopped on Day 31-represented by an arrow). The average influent hexavalent chromium concentration was 1,163 \pm 121 $\mu g/L$ (Days 1 to 36) and 1,183 \pm 163 $\mu g/L$ (Days 37 to 51), and percent removal was 94 \pm 8% in the column during the injection period. The influent concentration was increased on Day 37 to 10000 $\mu g/L$.

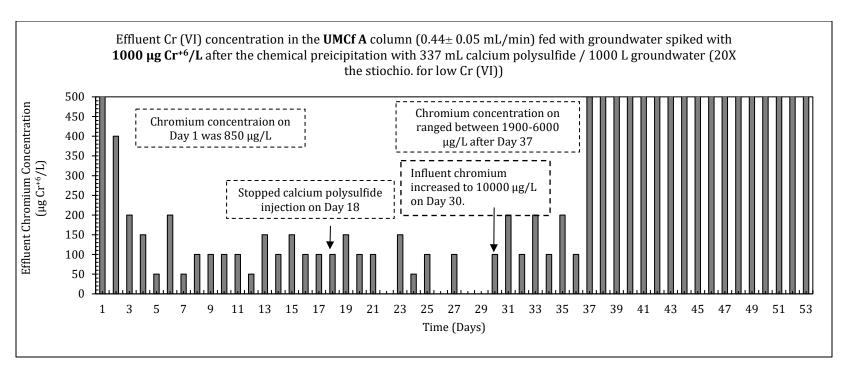


Figure 4.2: Effluent Cr (VI) concentrations in grab samples in the UMCf A column after chemical precipitation of chromium with calcium polysulfide. (Calcium polysulfide was stopped on Day 18 represented by an arrow). The average influent hexavalent chromium concentration was $876\pm171~\mu g/L$ (Days 1 to 29) and $907\pm139~\mu g/L$ (Days 30 to 53), and percent removal was $86\pm8\%$ in the column during the injection period. The influent concentration was increased on Day 30.

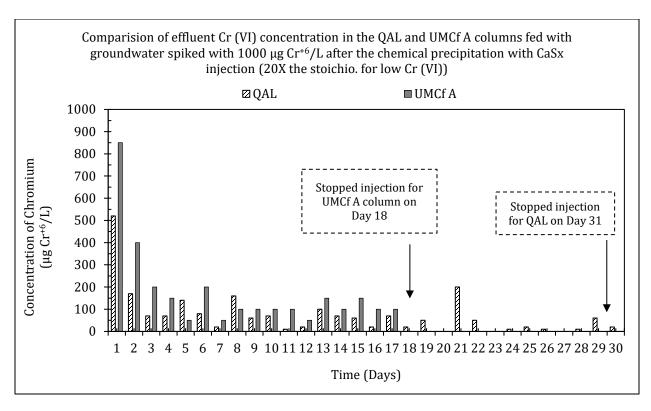


Figure 4.3: Comparision of effluent Cr (VI) concentrations in grab samples in the the QAL and UMCf A column during the injection of calcium polysulfide. (The days when the calcium polysulfide stopped are represented by arrows). The average influent hexavalent chromium concentration was $1163\pm121~\mu g/L$ in QAL and $876\pm171~\mu g/L$ in UMCf.

4.2.2 High Concentration Column Test

The effluent Cr (VI) concentrations in grab samples in UMCf B were below 50 μ g/L by Day 3, increased to 100 μ g/L on Day 8, and decreased below 50 μ g/L on Day 9. The effluent Cr (VI) fluctuated, but remained below 100 μ g/L throughout the injection period until Day 23—as shown in Figure 4.4. After stopping the CaSx injection, the effluent Cr (VI) in the column remained below 100 μ g/L until Day 28 and increased to 150 μ g/L on Day 29. After Day 31 the effluent Cr (VI) was again below 100 μ g/L. Note that on Days 28 and 31, the effluent Cr (VI) was below detection limit (10 μ g/L). After increasing the influent chromium concentration to 100000 μ g/L on Day 36, the effluent Cr (VI) broke through exceeding 200 μ g/L on Day 37. The result of this column test shows the removal of high concentration of chromium from the NERT groundwater is feasible, even when the contamination is located in the fine grained UMCf.

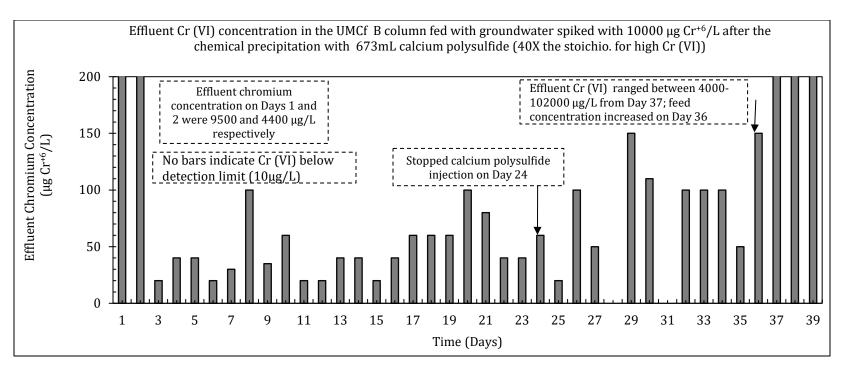


Figure 4.4: Effluent Cr (VI) concentrations in the UMCf B after chemical precipitation of chromium with calcium polysulfide. (CaSx was stopped on Day 24 represented by an arrow). The average influent Cr (VI) concentration was $9639 \pm 465 \, \mu g/L$ and percent removal of $93 \pm 22\%$ in the column during the injection period.

4.2.3 Total Dissolved Chromium Measured Using ICP for Low and High Concentration Columns

In the effluent of the columns, dissolved chromium was also analyzed. The analyses were performed in unfiltered, settled samples to mimic the natural entrapment of precipitates in the soil pores when CaSx is injected. Dissolved chromium concentrations measured by ICP in the effluent from QAL, UMCf A, and UMCf B columns are shown in Figures 4.5, 4.6, and 4.7, respectively. For all column samples, the dissolved Cr levels were below 10 μ g/L. It is worth mentioning that the Cr (VI) analyses, as discussed in the previous section, were measured in grab samples while dissolved chromium was measured in 24-hour-composite samples from the effluent. Therefore, CaSx injection—at the ratios investigated—will result in chromium concentrations that are below the drinking water standard of 10 μ g Cr/L for both low and high concentrations of chromium.

Figure 4.5 and Figure 4.6 show the dissolved chromium measured using ICP in 24-hour-composite samples for QAL and UMCf A, respectively. In QAL (Figure 4.5), the dissolved chromium reduced below 50 μ g/L by Day 2 and below 20 μ g/L on Day 3. The dissolved chromium increased in the effluent up to 23 μ g/L by Day 5, but decreased below 20 μ g/L by Day 6. It then was reduced below 2 μ g/L by Day 10 and remained below 2 μ g/L throughout the rest of the injection period. After stopping the injection, the dissolved chromium was measured once a week. On Day 35 (5 days after stopping the calcium polysulfide injection), the dissolved Cr was 0.95 μ g/L. After increasing Cr concentration of the feed on Day 37, the chromium increased to 1 μ g/L on Day 40 (3 days after increasing feed) and was about 10 μ g/L on Day 48 (ie. 17 days after increasing the feed).

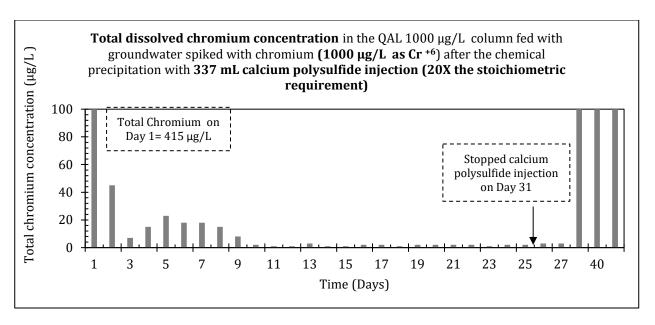


Figure 4.5: Total dissolved chromium concentrations measured in settled, but unfiltered composite samples in the QAL column throughout the study period. The vertical arrow indicates the day when the CaSx injection was stopped.

In the UMCf A column (Figure 4.6), the dissolved chromium concentration was below 40 μ g/L by Day 4 and below 2 μ g/L by Day 8. The concentration remained below the detection limit (10 μ g/L) throughout the injection period and even after stopping the injection. After increasing the Cr concentration in the feed to 10000 μ g/L on Day 31, dissolved chromium increased to 5 μ g/L on Day 33 and continued to gradually increase with time. By Day 52, the dissolved chromium was 5514 μ g/L (ie. 22 days after increasing the feed concentration).

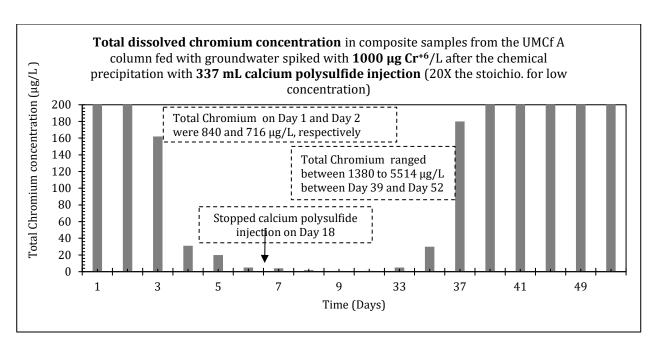


Figure 4.6: Total dissolved chromium concentrations measured in settled, but unfiltered composite samples in the UMCf A column throughout the study period. The vertical arrow indicates the day when the calcium polysulfide injection was stopped for each column.

In UMCf B column (Figure 4.7), the dissolved chromium concentration was 3 μ g/L by Day 5 and remained below 3 μ g/L throughout the injection period and even after stopping the injection. After increasing the Cr concentration of the feed to 10000 μ g/L on Day 36, dissolved chromium increased to 74700 μ g/L on Day 39 (ie. 3 days after increasing the feed concentration).

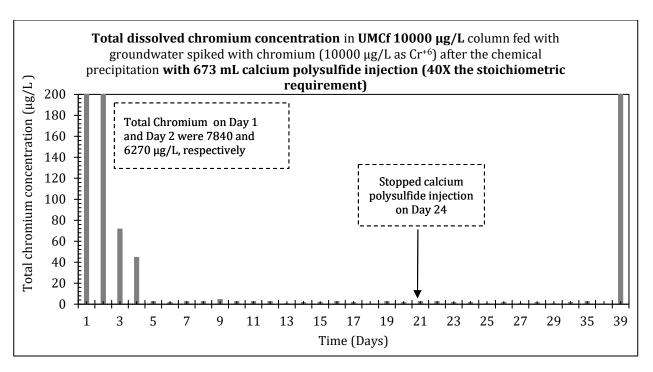


Figure 4.7: Dissolved chromium concentrations measured in settled, but unfiltered composite samples in the UMCf B columns throughout the study period. The vertical arrow indicates the day when the calcium polysulfide injection was stopped for each column.

4.2.4 CaSx Utilization

The total amounts of CaSx used were 24 mL/kg dry soil in QAL, 2.04 mL/kg dry soil in UMCf A, and 9.2 mL/kg dry soil in UMCf B column. Almost 10 times more CaSx was injected in the QAL column than in the UMCf column treating the same Cr (VI) concentration (1000 μ g/L) because of the higher flowrate in the QAL column. Table 4.9 shows the mass of Cr (VI) entering the column (influent) and the volume of CaSx injected into the columns.

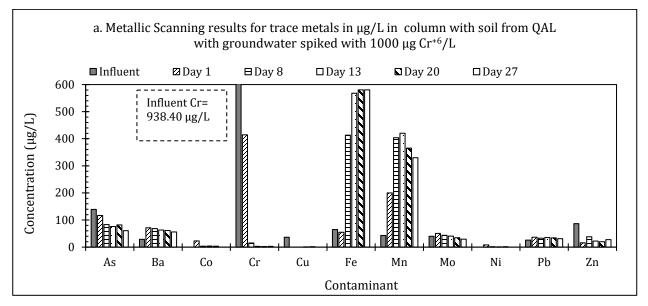
Table 4.9: Mass calculation of Cr (VI) in the influent and CaSx injected in the columns

Columns	Injection days	Cr mass (g) in the influent	Total CaSx injected to the columns (mL)	CaSX injected (mL CaSx/g influent Cr)
QAL	30	0.114	60	526.3
UMCf A	17	0.0088	5.1	579.5
UMCf B	23	0.227	23	101.3

4.2.5 Metallic Scanning for Low and High Concentration Columns

Figures 4.8 (a) and (b) show the results of trace metal and major element analyses for the influent groundwater and effluent from the QAL column, on days 1, 8, 13, 20, and 27. **Barium, molybdenum, and lead concentrations in the effluent samples gradually increased on Day 8**, but slightly decreased with time. Iron concentration in the effluent samples continuously increased with time. However, barium concentrations are below 100 μ g/L, iron below 600 μ g/L, lead below 40 μ g/L, and manganese below 400 μ g/L. **Manganese concentration increased up to the Day 13 sample and decreased after Day 20**. The manganese concentration in the effluent was almost 3 times the concentration in the influent groundwater on Day 27.

By Day 27, arsenic concentration decreased by half and zinc concentration by a third in the effluent compared to the influent groundwater. Since the chromium was removed in the columns, it was expected for total dissolved chromium to decrease. The total dissolved chromium was non-detectable from Day 13 and Day 20 in the effluent samples, but increased to 2 μ g/L on Day 27. Copper, present in the influent, was not detected in any effluent samples. The concentrations of major elements aluminum, calcium, potassium, magnesium, sodium, sulfur, and, silicon were unchanged from influent to effluent (Figure 4.8 b).



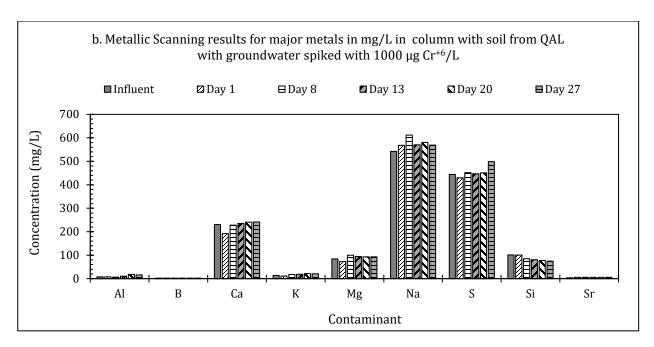
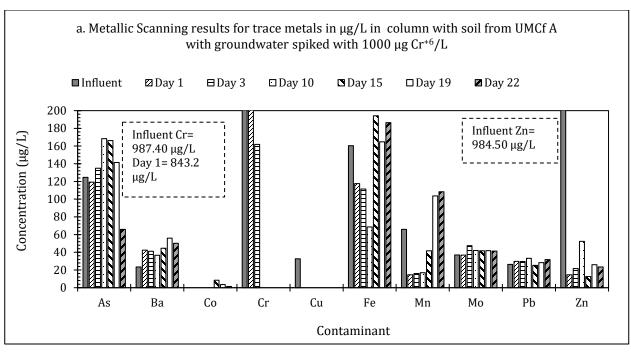


Figure 4.8: Total metal concentrations in the QAL in μ g/L (a) mg/L (b).

Figure 4.9 (a) and (b) show the results of trace metal and major element analyses for the influent groundwater and effluent from the UMCf A column on Days 1, 3, 10, 15, 19 and 22. Arsenic concentration increased with time, but decreased by half on Day 22 (last sample). Barium increased over time and doubled by Day 22. Iron and manganese concentrations in the effluent samples decreased until Day 10 and gradually increased afterwards. Iron concentration was almost the same as the influent groundwater and Mn almost doubled in the effluent by Day 22. Molybdenum and lead remained the same as the influent groundwater. Since the chromium was removed in the columns, it was expected that total dissolved chromium would decrease. The total dissolved chromium was non-detectable from Day 10 in the effluent samples. Zinc was almost 50 times less in Day 22 samples compared to the influent groundwater. Note that copper is present only in the influent.

The concentrations of aluminum, calcium, potassium, magnesium, sodium, sulfur, and silicon in the effluent remained almost the same as the influent groundwater (Figure 4.9 b).



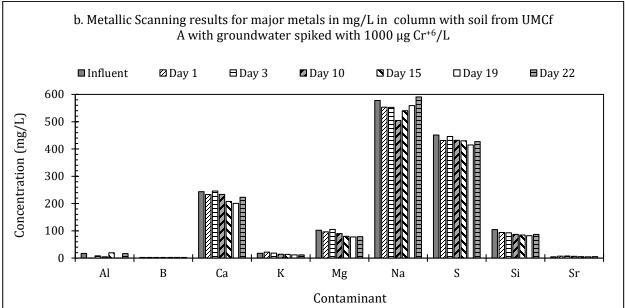
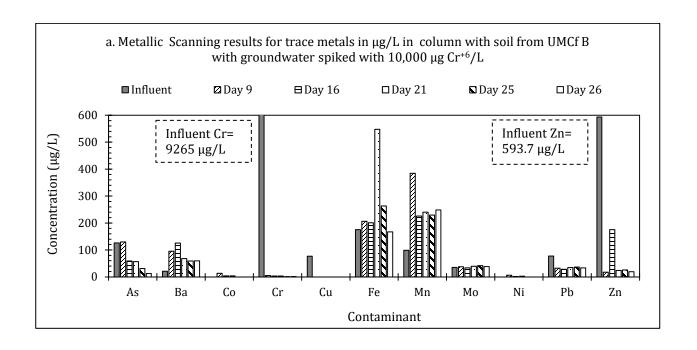


Figure 4.9: Total metal concentrations in the UMCf A in $\mu g/L$ (a) mg/L (b).

Figure 4.10 (a) and (b) shows the analytical results for trace metal and major element analyses for the influent groundwater and effluent from the UMCf B column on Days 9, 16, 21, 25, and 26. Arsenic concentration decreased with time and was 100 times lower than the influent groundwater on Day 26 (last sample). Barium concentration tripled by Day 21 and

decreased afterwards such that the effluent concentration on Day 26 was the same as the influent groundwater. **Iron and manganese concentrations in the effluent samples increased on Day 21 and Day 9, respectively, and both decreased in following days.** Iron was almost the same as the influent groundwater, and Mn was double the groundwater on Day 26. The molybdenum concentration remained the same as the influent groundwater. The chromium decreased to non-detectable values from Day 9 in the effluent samples. Lead concentration decreased to half that in the influent and stabilized. The zinc concentration deceased by 30 times from the influent concentration to the Day 26 effluent samples. The concentrations of aluminum, calcium, potassium, magnesium, sodium, sulfur, and silicon in the effluent remained relatively unchanged from the influent groundwater concentrations (Figure 4.10 b).

In summary, the impact of CaSx injection on the release of other elements present in the aquifer is small—with most elemental concentrations remaining very low (generally <100 ppb) and stable. Arsenic concentrations generally decreased with polysulfide addition. Lead concentrations increased in QAL slightly but remained <50 ppb. Iron and managanese increased, but both concentrations were below 600 μ g/L.



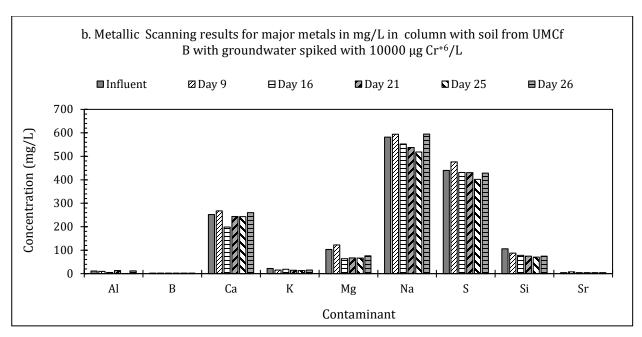


Figure 4.10: Total metal concentrations in the UMCf B in $\mu g/L$ (a) mg/L (b).

CHAPTER 5 RESULTS AND DISCUSSIONS OF BIOLOGICAL REDUCTION

5.1 Batch Biological Test

5.1.1 Phase I Batch Microcosm Testing using EOS-PRO, Industrial Sugar Wastewater (ISW), a Mixture of EOS-PRO and ISW, and Molasses as Substrate

The methodology for the phase I batch microcosm testing can be found in section 2.6.1. The experimental matrix used in the microcosm tests is depicted in Appendix E (Table E.5). The estimated initial COD added to all microcosms was 12,000 mg/L, either as EOS-PRO, Industrial Sugar Wastewater, or a mixture of both—hence the use of the term "COD equivalent" to represent the organic content, independent of the source. Figure 5.1 shows the COD values in the microcosms for EOS-PRO, Industrial Sugar Wastewater, and the mixture of the two at 1.25 parts of Industrial Sugar Wastewater to 1 part EOS-PRO (Mix). The COD values confirm that there was more than sufficient carbon substrate to support biodegration in both QAL and UMCf.

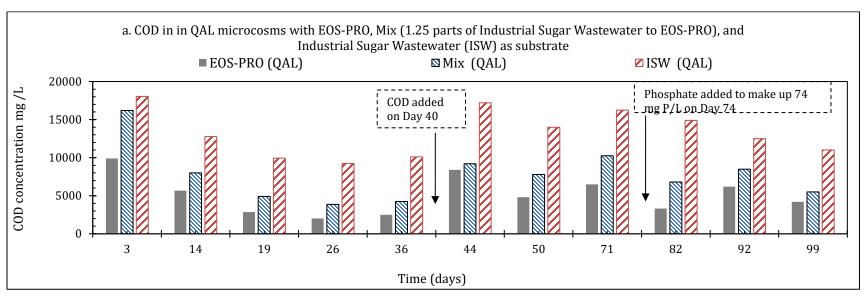
Microcosm COD Levels

Notice that for the entire experimental period, the COD of EOS-PRO and Mix bottles had a lower value than that of the Industrial Sugar Wastewater. The reason for this disparity is the absorption of EOS-Pro oil into the soil, leaving less oil in the liquid phase. The wastewater does not absorb into soil and therefore the soluble COD is higher. Also, notice that the initial COD values for the samples with Industrial Sugar Wastewater were much higher than the estimated 12,000 mg/L. The higher values of COD in Mix and Industrial Sugar Wastewater relate to the nature of the the Industrial Sugar Wastewater. The Industrial Sugar Wastewater contains liquid as well as some biodegradable solids. It is thought that with time the solids dissolved thereby increasing the soluble COD (i.e. measured in filtered samples). Since the solids present have been shown to dissolve with time and become soluble COD for bacterial use, it is not very likely the solids would clog the aquifer.

Figure 5.1 shows the COD for the EOS-PRO, Industrial Sugar Wastewater, and the mixture (Mix) microcosms. The COD for EOS-PRO microcosm on Day 3 was about 20% less than the initial estimated COD. From Day 3 to Day 36, the COD decreased continuously—indicating it was being used up. On Day 40, more COD was injected into the bottles to assure enough susbstrate to feed

the biodegradation of the contaminants. For both QAL and UMCf, after addition of more COD on Day 40 the decrease in COD levels was less prominent; this is especially true for UMCf, where the COD levels of Industrial Sugar Wastewater stayed basically the same from Day 44 to Day 99.

The COD was not measured on the microcosm of Days 7 and 11 as they were from the same bottle sampled on Day 3. However, starting on Day 19, the COD was measured in the microcosms that had been previously sampled. Because the biodegradation took longer than planned—starting on Day 19—we did not sacrifice each bottle as with previous sampling. Instead, 20 mL of liquid was taken and the bottle was kept again in the shaker for future sampling. Resampling was done when significant degradation was not observed. This was necessary to assure enough bottles would be available for longer periods of incubation. The COD levels in the microcosms resampled for a second time were lower because oil is lost with continuous sampling. Sampling is performed by allowing the microcosm sample to sit for 8 hours—to assure the fine solids settle—before clear liquid from the top is removed. During settling, a film of oil forms on top and is removed with the liquid, thereby decreasing the total amount of oil present. Note that the same microcosms were resampled on: Day 3, Day 7 and Day 14; Day 19 and Day 26; Day 44 and 50; Day 71 and Day 82; and Day 92 and Day 99.



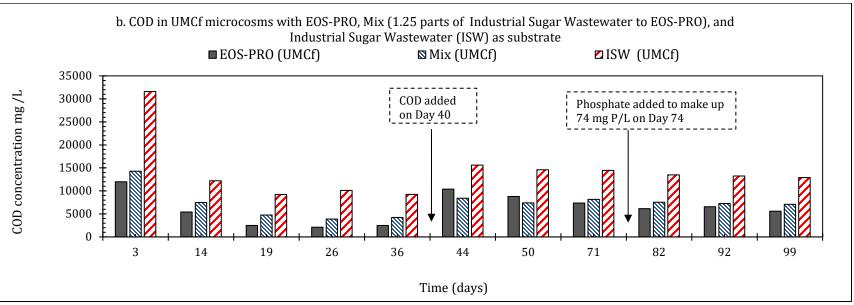


Figure 5.1: COD concentration in filtered samples in QAL (a) and UMCf (b) microcosms.

Figure 5.2 shows the COD in QAL and UMCf microcosms with Molasses as the substrate. Note that phosphate addition was needed because the Molasses used did not contain significant amounts of phosphate. The COD continuously decreased—showing that molasses was being used. The COD was reduced to about 18% of the initial estimated COD on Day 3, about 50% on Day 19, and 67% on Day 99 in both QAL and UMCf.

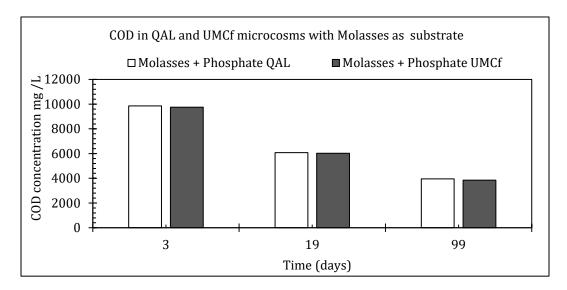
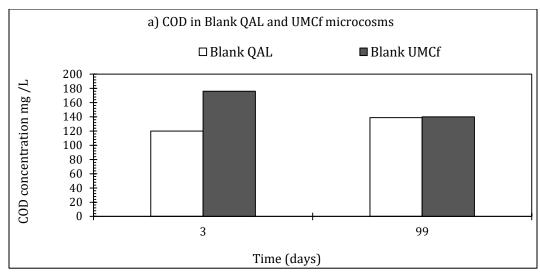
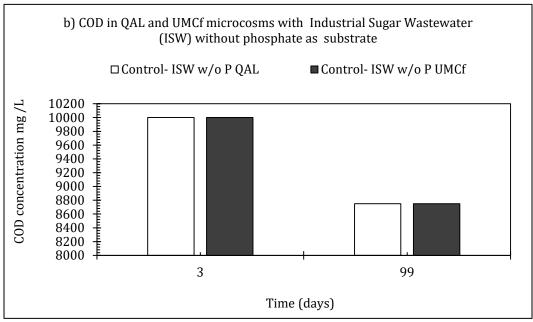


Figure 5.2: COD concentration in filtered samples in QAL and UMCf using Molasses with phosphate as substrate

Figure 5.3 shows the COD in the control microcosms: blank (a), Industrial Sugar Wastewater without phosphate (b), and Molasses without phosphate (c). Notice that the COD of QAL and UMCf, without the addition of any extra substrate, is very small and below 180 mg/L. There is little variation between Day 3 and Day 99 CODs showing that not much degradation took place. For the phosphate blanks—where additional phosphate was not added—notice that on Day 99, the COD decreased by about 27% and 12% for Industrial Sugar Wastewater without phosphate and Molasses without phosphate, respectively. This was true for both QAL and UMCf. These results point to some level of degradation occurring—supported by the small amount of phosphate available in the substrates.





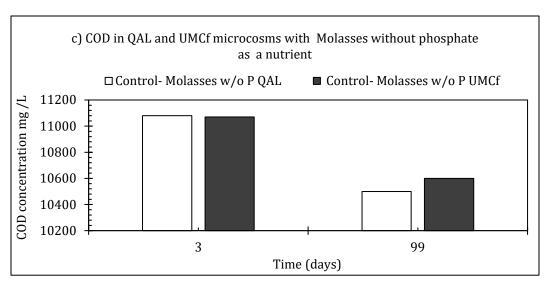


Figure 5.3: COD in QAL and UMCf control microcosm: blank (a), Industrial Sugar Wastewater without phosphate (b), and Molasses without phosphate (c).

Notice that the COD remaining in the liquid phase of the microcosm was above 2,000 mg/L in all cases. Therefore, the amount of substrate used was much more than needed. However, one has to consider the application of these substrates in the field. Because EOS-PRO oil absorbs into the soil, as it is applied to the groundwater the oil will remain in the aquifer for bioremediation. Industrial Sugar Wastewater is soluble and highly biodegradable and it was shown here to help speed up bioremediation. However, in an aquifer, it will flow with the groundwater and may end up in the aquifer discharge area (i.e. the Las Vegas Wash in the case of NERT). For field application, future optimization of substrate dosage will be necessary because it will dictate well spacing, application frequency of substrate, and monitoring schedule. In addition, as will be discussed below, not all substrates impacted biological reduction in the same manner. While Industrial Sugar Wastewater was very effective in supporting chromium degradation, it was not preferred by bacteria to reduce nitrate, chlorate, or perchlorate.

Cr (VI) Degredation

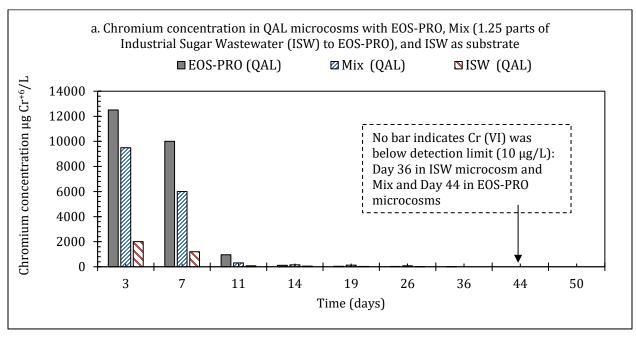
The Cr (VI) degradation in QAL microcosms is shown in Figure 5.4. On Day 3, the Cr (VI) was about 2000 μ g/L in the Industrial Sugar Wastewater, about 10000 μ g/L in EOS-PRO, and 13000 μ g/L in the Mix microcosms. On Day 11, the Cr (VI) decreased to 80 μ g/L

in Industrial Sugar Wastewater, 300 μ g/L in Mix, and 960 μ g/L in EOS-PRO microcosms. Cr (VI) in EOS-PRO microcosms was about 10 μ g/L and the Mix and Industrial Sugar Wastewater microcosms were below detection limit (10 μ g/L) by Day 36. Therefore, the results show that all substrates used can support chromium reduction. However, Industrial Sugar Wastewater alone or mixed with EOS-PRO promotes faster degradation rates. To reach Cr (VI) concentrations below 100 μ g/L, it took the Industrial Sugar Wastewater substrate 11 days as compared to 19 days for EOS-PRO. Nonetheless, all substrates studied promoted chromium reduction in the alluvial (QAL), from 14,000 μ g/L to < 10 μ g/L within 36 days.

Figure 5.4 (b) shows the Cr (VI) degradation in UMCf microcosms. On Day 3, the Cr (VI) was less than 2000 μ g/L in the Industrial Sugar Wastewater, about 10000 μ g/L in EOS-PRO, and about 14000 μ g/L in the Mix microcosms. On Day 11, the Cr (VI) decreased further to 50 μ g/L in Industrial Sugar Wastewater, 800 μ g/L in Mix, and 1040 μ g/L in EOS-PRO microcosms. On Day 36, Cr (VI) in the Mix and Industrial Sugar Wastewater microcosms were below detection limit (10 μ g/L). The degradation was much slower for EOS-PRO microcosms, and only on Day 58 was the Cr (VI) was below detection limit (10 μ g/L). Chromium reduction in the UMCf groundwater can also be achieved using any of the three substrates studied.

For both QAL and UMCf, the addition of a highly biodegradable substrate— Industrial Sugar Wastewater—promotes faster degradation rates. Chromium reduction rates in the UMCf were slower than those for QAL. Although 10 µg/L remaining chromium was obtained within 36 days for UMCf—using Industrial Sugar Wastewater or a mixture of EOS-PRO oil and Industrial Sugar Wastewater—it took 58 days for EOS-PRO alone to reach these levels. It is suspected that the reason for the slower degradation in the presence of EOS alone relates to the slower release of EOS-PRO oil from the UMCf as compared to QAL. Therefore, for UMCf remediation it is advantageous to supplement with a highly biodegradable substrate. Using a highly biodegradable substrate alone is not recommended because of the high concentrations of co-contaminants present. These co-contaminants significantly raise the required substrate dosages because of the lower COD available from soluble substrates. Emulsified oil has a COD of 2,000,000 mg/L as compared to 100,000

mg/L for sugar, a soluble substrate. Therefore, the amount of sugar needed to perform the same remediation work would be 20 times that of emulsified oil. Notwithstanding amounts required, in the future economical evaluations will be needed to decide the pros and cons for the use of various carbon substrates at NERT.



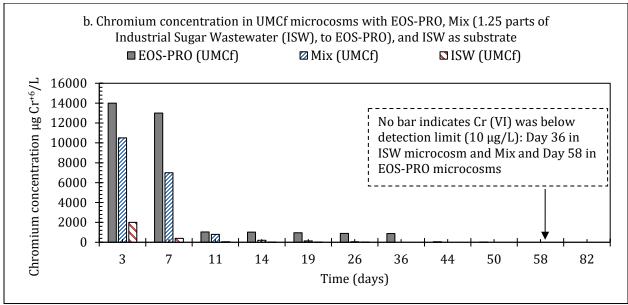


Figure 5.4: Cr (VI) in QAL (a) and UMCf (b) microcosms with EOS-PRO, Mix, and Industrial Sugar Wastewater as substrate.

In both QAL and UMCf microcosms, the majority of the Cr (VI) (88% in QAL and 91% in UMCf) was removed by Industrial Sugar Wastewater by Day 3. Given the presence of microbes in the experiments, one may assume that the degradation was biotic. However, there is also a possibility of abiotic reduction. In this study, no investigation was performed to separate biotic and abiotic reduction of Cr (VI). However, Chen et al. (2015) demonstrated that sugarcane molasses can reduce Cr (VI) to Cr (III) in the absence of bacteria. The reaction mechanism was proven to be that Cr (VI) readily accepts electrons from the phenolic hydroxyl group of polyphenol present in molasses, and it is then reduced to Cr (III). In the process, the polyphenol is converted to a quinone. Since the Industrial Sugar Wastewater used in this study also results from plant products, there is possibility phenolic groups were present, but phenol analyses were not performed.

Appendix E (Section E.3) shows the potential abiotic chemical contribution of Industrial Sugar Wastewater on Cr (VI) reduction for the the NERT groundwater (about 50%). The tests shown in Appendix E—performed after the microcosm study had been completed—show some possibility of abiotic reduction. Although there is a possibility of abiotic reduction, biotic reduction also took place in the microcosms where EOS-PRO alone was used. Notwithstanding the distinction between biotic and abiotic reduction, while slower than Industrial Sugar Wastewater, Mix microcosms removed Cr (VI) faster than EOS-PRO microcosms.

Figure 5.5 shows the Cr (VI) reduction in microcosms where molasses was used as a substrate. By Day 7, about 70% of the Cr (VI) was removed in QAL microcosms and about 60% in UMCf microcosms. By Day 19, Cr (VI) was reduced by about 80% in QAL microcosms and 75% in UMCf microcosms. The Cr (VI) on Day 50 was below the detection limit (10 µg/L) for both. Reduction in UMCf was slower than in QAL, as seen in the microcosms using EOS-PRO and Industrial Sugar Wastewater. Nonetheless, the results show that molasses can also be used a substrate to reduce Cr (VI) at this site. Given the microcosms using molasses generated a significant amount of methane gas—enough to explode several of the microcosm bottles—bio-reduction is likely to have occurred. However, abiotic reduction was not evaluated.

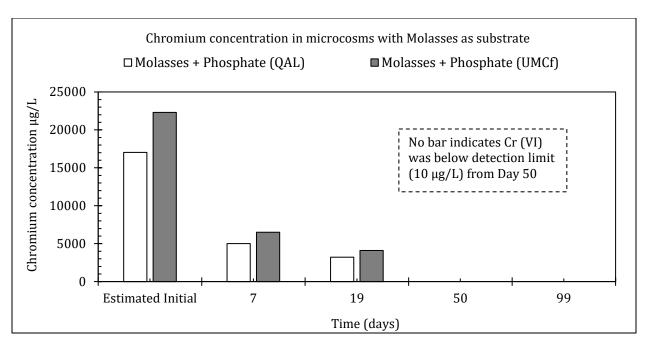
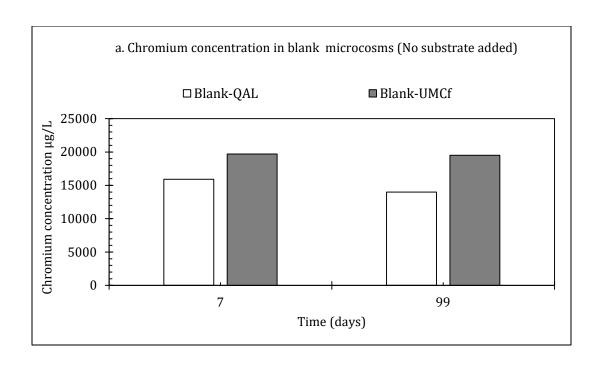
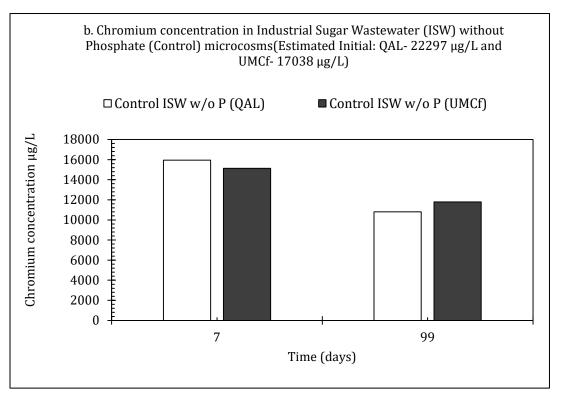


Figure 5.5: Cr (VI) in microcosms with Molasses as substrate with phosphate.

The Cr (VI) concentrations in the blank microcosms are presented in Figure 5.6 (a). Cr (VI) concentration on Day 7 remained almost same through Day 99 indicating that Cr (VI) will not be reduced at this site if substrate is not added. The control microcosms with Industrial Sugar Wastewater without phosphate indicated about 30% Cr (VI) was removed on Day 7 and about 50% on Day 99 in QAL. About 11% Cr (VI) was removed on Day 7 and about 30% on Day 99 in the UMCf microcosms (Figure 5.6 b). The results indicate that phosphate, in addition to the small amount present in the Industrial Sugar Wastewater, is needed to promote faster degradation. The results also revealed, as found in earlier tests, that degradation in QAL is faster than in UMCf. The control microcosms with Molasses without phosphate indicated that about 7% Cr (VI) was removed by Day 7 and about 80% by Day 99 in QAL and UMCf microcosms (Figure 5.6 c). The results further support the need for phosphate addition to promote fast degradation.





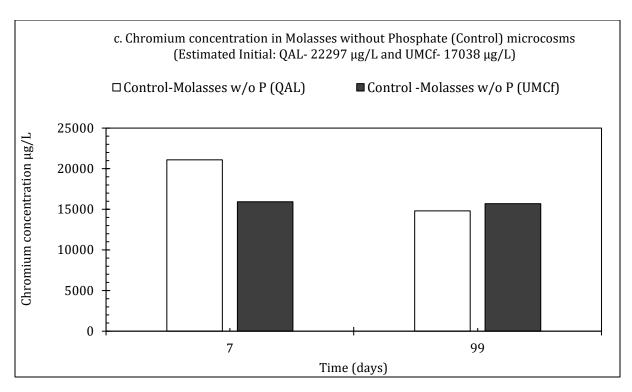


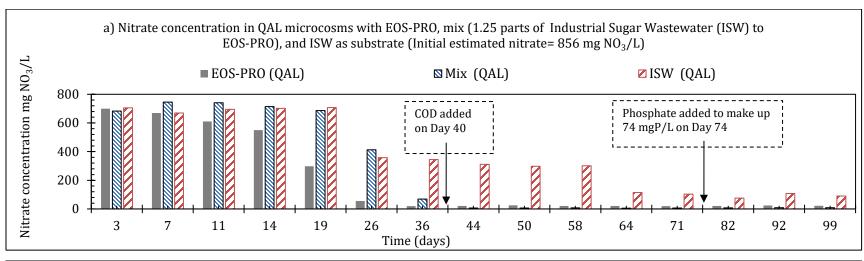
Figure 5.6: Cr (VI) in QAL and UMCf control microcosm- blank (a), Industrial Sugar Wastewater without phosphate (b), and Molasses without phosphate (c).

Nitrate Reduction

Nitrate reductions in the QAL and UMCf microcosms are depicted in Figures 4.7 (a) and (b). As expected, significant nitrate reduction occurred only after chromium was almost completely degraded, since Cr (VI) is a preferred electron acceptor to nitrate. Notice that the nitrate concentrations found at this site are extremely high and above 600 mg/L for QAL and 200 mg/L for UMCf. Significant nitrate reduction was observed Day 19 and Day 26, respectively, in QAL and UMCf microcosms when EOS-PRO and a mixture of EOS-PRO and Industrial Sugar Wastewater were used. However, Industrial Sugar Wastewater alone did not support nitrate reduction well and much slower reductions were observed. While EOS-PRO alone promoted significant nitrate reduction by Day 19, with Industrial Sugar Wastewater significant reduction was not observed until Day 26. The nitrate data is consistent with the COD data discussed earlier. For microcosms fed Industrial Sugar Wastewater, the COD values were high—indicating the Industrial Sugar Wastewater was not being used sufficiently fast. Similar to that observed for Cr (VI), biological nitrate

reduction is slower in UMCf compared to that in QAL. By Day 44, almost all nitrate was degraded in QAL microcosms a compared to > 99 days for UMCf.

Figure 5.7 (b) shows the nitrate concentrations in the UMCf microcosms. The nitrate concentration decreased slightly by Day 26 for all microcosms, which was after Cr (VI) degradation. After adding substrate on Day 40, only Mix and Industrial Sugar Wastewater microcosms showed higher nitrate concentrations on Day 44. Nitrate concentrations in the EOS-PRO microcosms did not increase, indicating some nitrate is present in the Industrial Sugar Wastewater. The nitrate concentration further increased on Day 50 in Mix and Industrial Sugar Wastewater microcosms. On Day 58, the nitrate concentrations decreased to about 20mg/L as NO₃ in EOS-PRO and Mix microcosms. However, nitrate concentration remained about 80 mg/L as NO₃ in Industrial Sugar Wastewater microcosm even by Day 99.



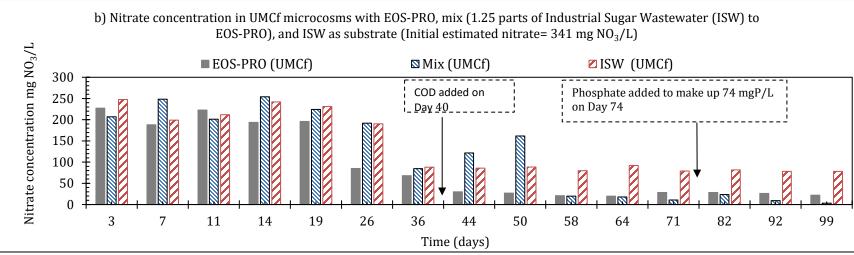


Figure 5.7: Nitrate concentration in QAL (a) and UMCf (b) microcosms with EOS-PRO, Mix, and Industrial Sugar Wastewater as substrate

Figure 5.8 shows the nitrate concentration in the molasses microcosms. The dark color of molasses interfered with nitrate analysis using the Hach method. Therefore, nitrate was analyzed using ion chromatography. The nitrate was below detection limit (1 mg/L as NO₃) by Day 19 in both QAL and UMCf as shown in Figure 5.8 on Day 19. Molasses is a well documented substrate for nitrate biodegradation (Lindow, 2004). Soluble chromium concentration on Day 19 was about 3000-4000 μ g/L in the QAL and UMCf microcosms. It seems Cr (VI) and nitrate were degraded simultaneously in the molasses microcosms.

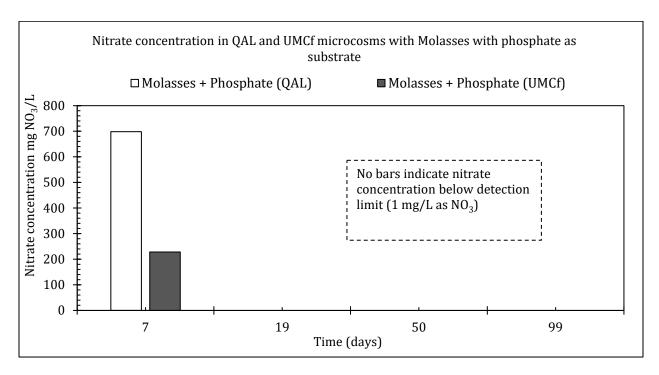
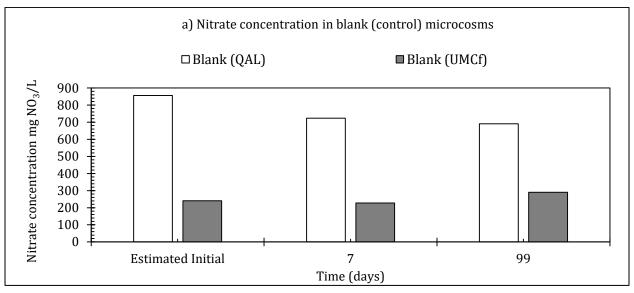
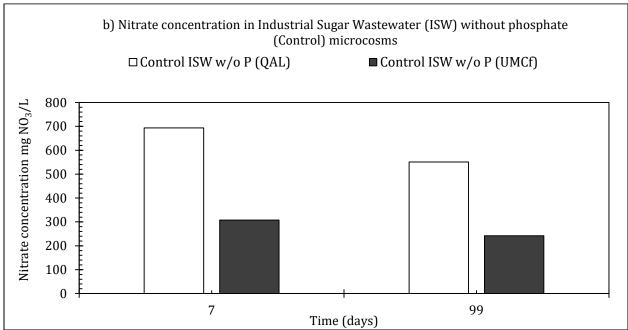


Figure 5.8: Nitrate concentration measured by IC for QAL and UMCf microcosms with Molasses with phosphate as substrate.

The nitrate concentration in the control microcosms are presented in Figure 5.9. Figure 5.9 (a) shows that the nitrate concentration in the Blank (without substrate) remained almost the same throughout the period for both QAL and UMCf. By Day 99, in microcosms with Industrial Sugar Wastewater without phosphate and Molasses without phosphate the concentration reduction was about 1-2% (Figure 4.9 (b) and Figure 4.9 (c), respectively). This small decrease is within experimental analysis error. Therefore, for

degradation of nitrate to occur at the AP site of NERT, a substrate and phosphate—as a supplemental nutrient—is needed.





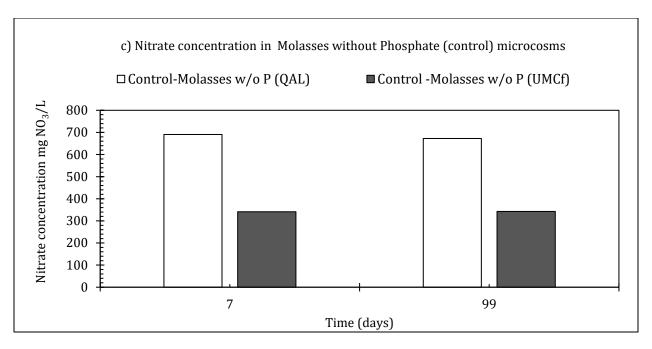


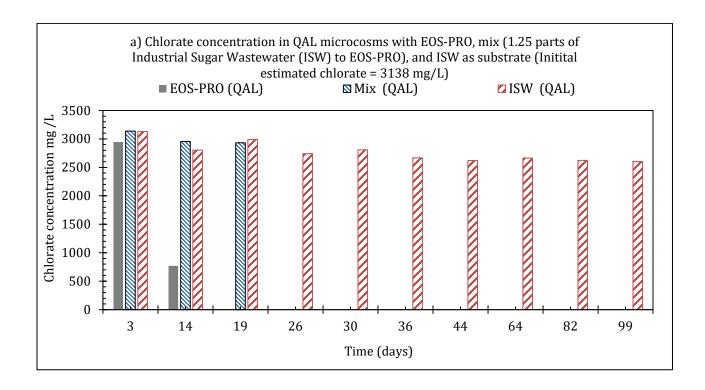
Figure 5.9: Nitrate concentrations in control microcosms: blank (a), Industrial Sugar Wastewater without phosphate (b), and Molasses without phosphate (c).

Chlorate Reduction

Figure 5.10 (a) shows the chlorate concentration in the QAL microcosms. Chlorate degradation was observed on Day 14 (about 75%) in the EOS-PRO microcosms, which was the same day when nitrate degradation was observed. Therefore, there was some concomitant degradation of nitrate and chlorate. The data reveals that EOS-PRO supports chlorate reduction very well, while Industrial Sugar Wastewater does not. Chlorate concentrations in microcosms where Industrial Sugar Wastewater was used did not change much over the course of the experiment. However, the opposite was noted for Cr (VI) reduction. While chromium reduction is supported by all substrates tested, especially by Industrial Sugar Wastewater, the degradation of nitrate and chlorate is better supported by EOS-PRO oil.

Chlorate concentration was below detection limit (5 mg/L) on Day 19 in the EOS-PRO microcosm. For the Mix microcosm, chlorate degradation was not observed until after Day 19 and was below the detection limit on Day 26. For Industrial Sugar Wastewater, only about 26% of the chlorate was removed by Day 99.

Figure 5.10 (b) shows the chlorate concentration in the UMCf microcosms. Chlorate degradation was observed on Day 36 in the EOS-PRO microcosms (about 39%), which was the same day when nitrate degradation was observed in UMCf microcosms with EOS-PRO. The chlorate concentration was below detection limit (5 mg/L) for the EOS-PRO microcosm on Day 71 only. For Mix microcosms, chlorate degradation was not observed until Day 44 and was below the detection limit on Day 82. For Industrial Sugar Wastewater microcosms, only about 8% of the chlorate degraded by Day 99. The lower degradation of chlorate in Industrial Sugar Wastewater suggests that Industrial Sugar Wastewater did not support chlorate degradation as compared to EOS-PRO.



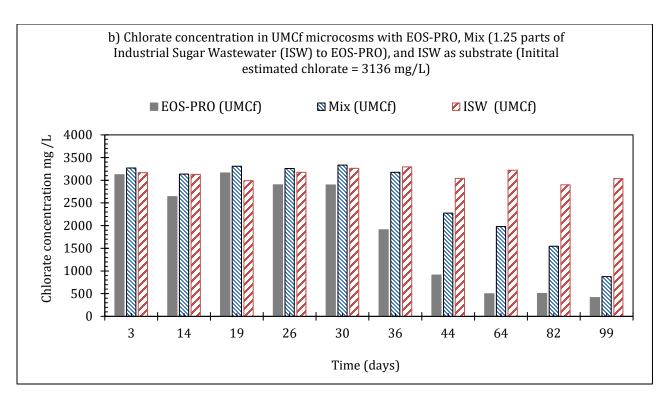


Figure 5.10: Concentration of chlorate in QAL (a) and UMCf (b) microcosms with EOS-PRO, Mix, and Industrial Sugar Wastewater as substrate

Figure 5.11 shows the chlorate concentrations in the QAL and UMCf microcosms using Molasses as substrate. The chlorate degradation was noted on Day 36 in both QAL and UMCf microcosms. Note that nitrate was below detection limit by Day 19 when measured with ion chromatography (IC). Therefore, similar to EOS-PRO, molasses promotes the reduction of several of the contaminants of concern.

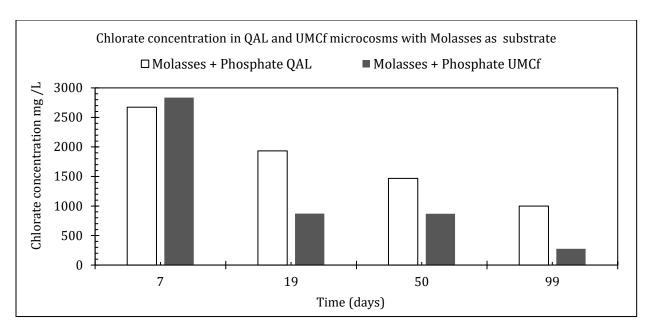
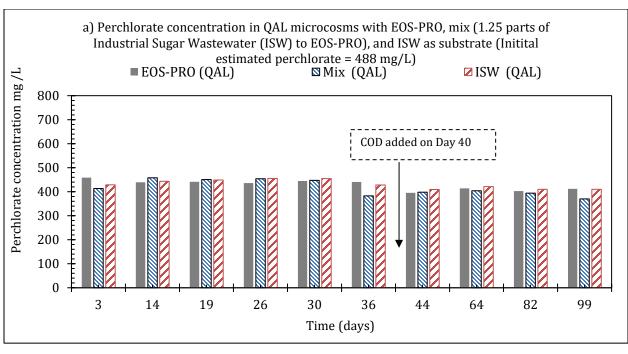


Figure 5.11: Chlorate concentration in QAL and UMCf microcosms with Molasses as substrate.

It is important to note that while chromium, perchlorate, and chlorate concentrations in the QAL and UMCf waters were similar, the nitrate concentration in QAL was approximately three times that of UMCf. This is important because significant chlorate degradation happened only after nitrate was significantly degraded. In the AP area, nitrate degradation is taking up a large percentage of the time required for remediation.

Perchlorate Reduction

Only very minor perchlorate degradation was observed in any of the microcosms during the 99 days of operation. In the microcosms fed with EOS, a 17-20% decrease was observed after Day 82 for both QAL and UMCf. Perchlorate concentration in the microcosms with EOS-PRO, Mix, and Industrial Sugar Wastewater are presented in Figure 5.12. Molasses microcosms are presented in Figure 5.13. Perchlorate reduction should follow that of chlorate, but that was not the case for QAL, since all the chlorate was already degraded in the EOS-PRO feed bottles.



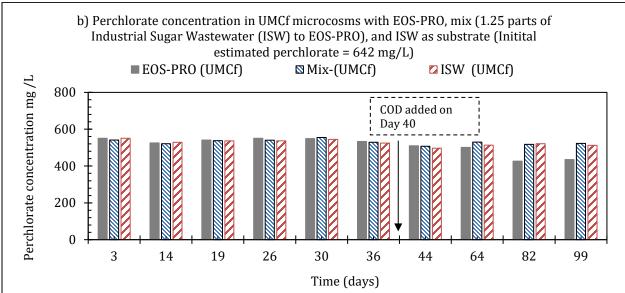


Figure 5.12: Perchlorate concentration in QAL (a), and UMCf (b) microcosms.

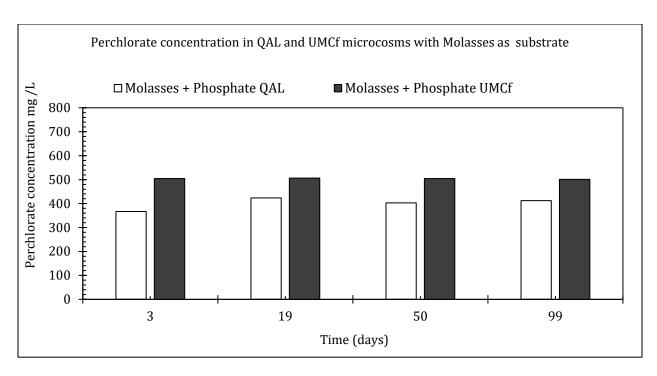
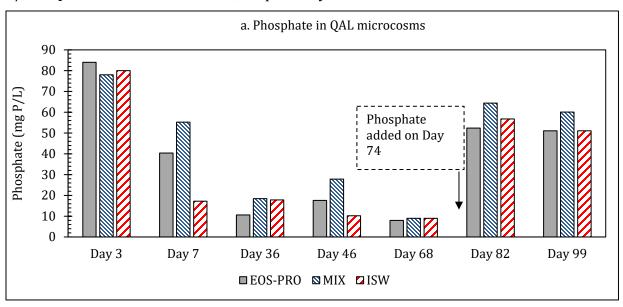


Figure 5.13: Perchlorate concentration in Molasses in QAL and UMCf microcosms.

Phosphate Concentration

Figure 5.14(a) and Figure 5.14 (b) show the phosphate concentrations measured in QAL and UMCf microcosms, respectively. It is important to note that the Industrial Sugar Wastewater itself contains 51.2 mg P/L, while EOS-PRO oil has 72 mg P/L. Therefore, additional phosphate was added to the microcosms that used Industrial Sugar Wastewater or a mixture of oil and Industrial Sugar Wastewater. Phosphate concentrations decreased gradually and on Day 68, the phosphate value was below 10 mg P/L in all three (EOS, ISW, and Mix) QAL microcosms and below 50 mg P/L for UMCf, EOS fed microcosms. The decrease in phosphate concentration matches the biological reduction observed in the microcosms. Notice that the phosphate on Day 3 was higher than the anticipated value. This finding is similar to the trend seen for the COD value. It is believed that the juice pulp from the Industrial Sugar Wastewater dissolves as microcosms are mixed and the dissolution contributes additional COD and phosphate beyond that originally calculated for the liquid alone.

To ensure the phosphate concentration was not limiting biodegradation, additional phosphate was injected into the microcosms on Day 74 to achieve phosphate concentrations of 70 mg P/L in QAL and UMCf microcosms. QA/QC evaluation detected that excess phosphate had been added to the UMCf EOS-PRO bottle and the phosphate in these bottles was higher than intended. Nonetheless, the microcosms were not limited by phosphate. By Day 99, phosphate concentrations were more than 50 mg P/L and 140 mg P/L in QAL and UMCf microcosms, respectively.



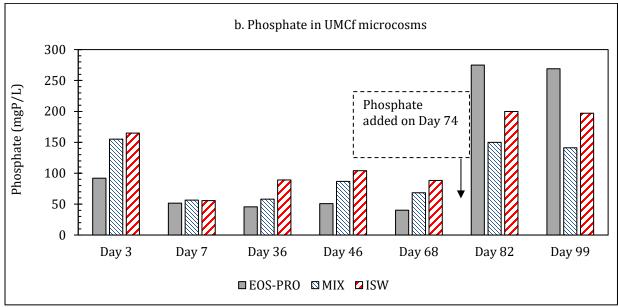
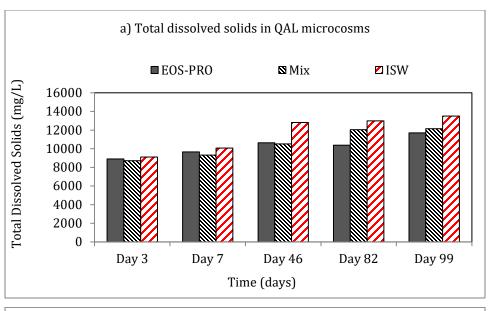


Figure 5.14: Phosphate concentration in the QAL (a) and UMCf (b) microcosms.

Total Dissolved Solids (TDS) Levels

Figure 5.15 (a) depicts the total dissolved solids (TDS) in the QAL microcosms. On Day 3, the TDS was about 8000 mg/L and gradually increased. The microcosms were a closed system and the source of increased TDS is interpreted as being the result of continuous dissolution of TDS contained in the soil as well as the dissolution the Industrial Sugar Wastewater pulp. The TDS in the Industrial Sugar Wastewater microcosm was higher because of substrate's high TDS content, including much sugar. On Day 99, the TDS in the QAL microcosms was more than 11,700 mg/L which was 30 to 48% more TDS than that of Day 3. The highest amount of TDS was 13,500 mg/L in Industrial Sugar Wastewater microcosms.

Figure 5.15 (b) shows the TDS in the UMCf microcosms. On Day 3, the TDS was about 9,000 mg/L and gradually increased. On Day 99, TDS in the UMCf microcosms was more than 12,200 mg/L which was 21-33% more TDS compared to Day 3. The highest amount of TDS was 12,290 mg/L in Industrial Sugar Wastewater microcosms. It is well known that TDS levels as low as 0.5% (5,000 mg/L) can reduce perchlorate degradation rates by half their unaffected value (Gingras and Batista 2002). The TDS of the AP area groundwater is > 8,000 mg/L (> 0.8%) and is likely the main reason for the slow perchlorate degradation. However, nitrate and chlorate were degraded in the microcosms, albeit slower than desired.



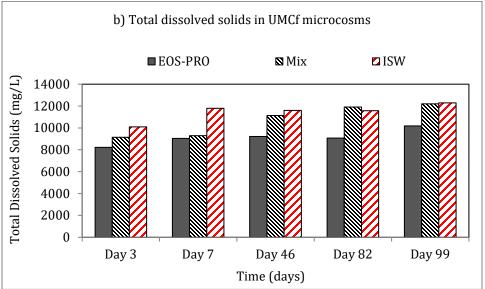
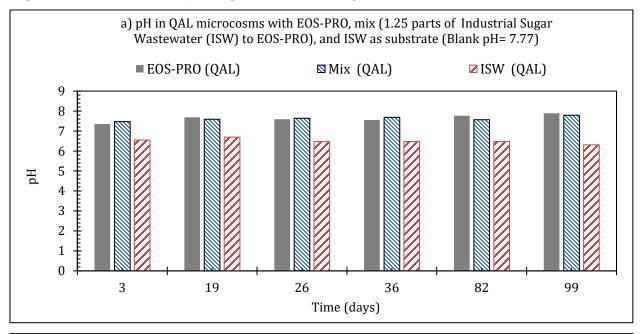


Figure 5.15: Total dissolved solids in QAL (a) and UMCf (b) microcosms.

PH Levels

The pH levels of the microcosms are shown in Figures 5.16 (a) and 5.16 (b). The pH of the Industrial Sugar Wastewater was 5.4. However, when mixed with the groundwater of NERT—which has an excellent buffering capacity—the pH was about 6.5. For the other microcosms fed with EOS-PRO, the pH was one order of magnitude higher at around 7.5. The pH levels of both microcosms are conducive to biological reduction and pH is not expected to have had a major impact on slower degradation kinetics.



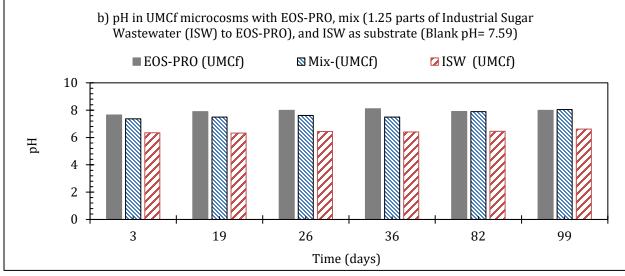


Figure 5.16: pH in QAL (a) and UMCf (b) microcosms.

Microbial Classification

The bacterial counts and microbial diversity found in the Phase I batch microcosm investigation are depicted in Table 5.1. Since the primary objective of the research was chromium reduction, chromium reducing bacteria were targeted in addition to overall bacteria diversity (Table 5.2). Microbial diversity and total bacterial number were examined in the beginning of the test (Day 4) and toward the end (Day 64). For the QAL soil microcosms fed with a mixture of EOS-PRO and Industrial Sugar Wastewater (ISW), the bacteria count per gram of soil was 4.57E+08 on Day 4 and 3.87E+08 on Day 64; for UMCf it was 2.99E+08 and 1.07E+08 on Days 4 and 64, respectively. Therefore, in the beginning of the test, the number of bacteria in QAL microcosm was 1.5 times that observed in UMCf. The lower number found in the UMCf was expected since deeper soils typically contain smaller number of bacteria compared to shallow ones. By Day 64, QAL microcosm had 3.6 times more bacteria than UMCf.

The QAL microcosms fed wtith EOS-PRO alone had a bacterial count of 8.02 E+7 per gram of soil on Day 64. Microcosms fed EOS-PRO alone had 3.7 times less bacteria than the mixture of EOS-PRO and Industrial Sugar Wastewater on Day 64. Therefore, the addition of the highly biodegradable Industrial Sugar Wastewater promotes the growth of a larger number of bacteria. One must keep in mind that these are total number of bacteria and not all of them may be involved in the degradation of the contaminants in question. When looking at specific bacteria, chromium reducing bacterial count was 1.7 E+08 on Day 64. This is about 27.6% of the total number of bacteria found for Day 64 (3.87 E+08).

The diversity of the bacteria community in the microcosms is shown in Figure 5.17. The complete diversity of bacteria is shown in Appendix G. For Day 4, over 70% of the bacteria were identified in QAL and UMCf as *Pseudomonas* and about 20% were *Acinetobacter*—well known denitrifying bacteria (Carlson and Ingraham, 1983; Lee et al., 2017). With time, at Day 64 the number of *Acinetobacter* decreased significantly and *Clostridium* and *Comamonas* become more prevalent. *Clostridium* has been reported as a chromium-resistant bacterium and is also involved in fermentation processes (Nguema and Luo, 2012; Formanek et al., 1997).

Table 5.1: Microbial Numbers and Diversity for the Phase I Microcosms Using Universal Primer

QAL (EOS-PRO and Industrial Sugar Wastewater) UMCf (EOS-PRO and Industrial Sugar Wastewater) Day 4 Day 64 Day 4 Day 64 4.57E+08 3.87E+08 2.99E+08 1.07E+08 Organism/ g soil Pseudomonas Pseudomonas Pseudomonas Pseudomonas 69.69% 64.92 % 80.21 % 67.71% sp sp Acinetobacter Acinetobacter Comamonas 19.82 % Clostridium sp 6.36 % 19.08 % sp 8.85% sp sp Classification of Arthrobacter Sedimentibacter Arthrobacter Clostridium bacterial species 3.22 % 6.09 % 0.17 % beijerinckii 8.23% sp sp

Table 5.2: Microbial Numbers and Diversity for the Phase I QAL Microcosms using Primer Specific for Chromium Reducing Bacteria

	(EOS-PRO and In	QAL dustrial Sugar Wastewater)	QAL (EOS-PRO alone)				
	Day 64 (Using primer for chromium reducer)			Day 64			
Organism/ g soil		1.07E+08	8.02E+07				
	Pseudomonas sp	89.97 %	Pseudomonas sp	79.62 %			
	Acinetobacter psychrotolerans	5.45 %	Aeromonas sp	7.88 %			
Classification of bacterial species	Pseudomonas salinarum	1.41 %	Acinetobacter sp	5.34 %			

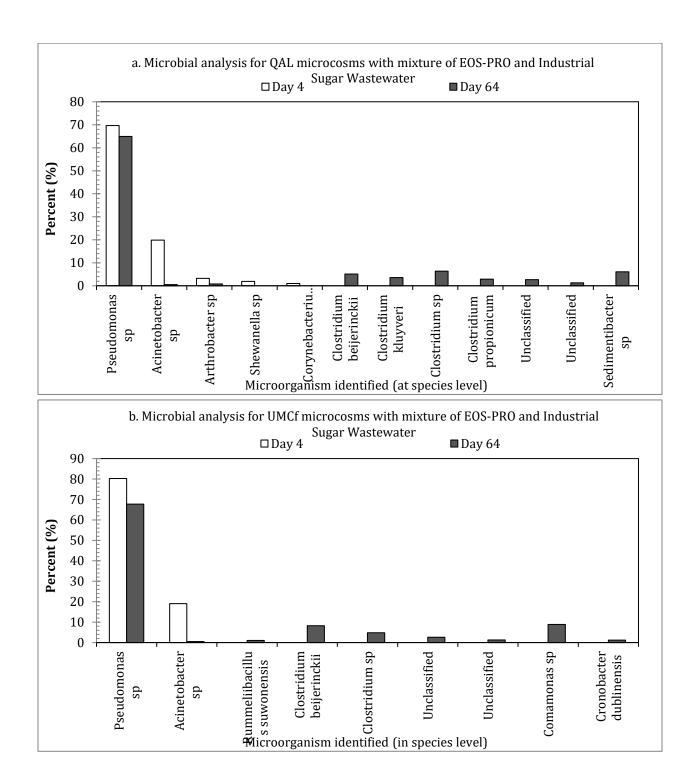


Figure 5.17: Microbial diversity for MIX microcosms for QAL (a) and UMCf (b) microcosms.

Figures 5.18 and 5.19 show the percentages of major chromium reducing bacteria in microcosms fed with a mixture of EOS-PRO and ISW and EOS-Pro alone on Day 64. The vast

majority of the bacteria were identified as *Pseudomonas sp.*—at about 90% for QAL fed the Mix and about 80% for QAL fed EOS-PRO alone. *Pseudomonas* have been identified often as chromium reducing bacteria (Megharaj et al., 2003; Dogan et al., 2011). Note also the presence of a halotolerant bacterim, *Pseudomonas salinarum*. Although present at only about 1.5% of total, the presence of bacteria that can grow in high levels of salt (i.e. TDS) is encouraging, given that high salt levels are known to negatively impact the growth of non-salt tolerant bacteria.

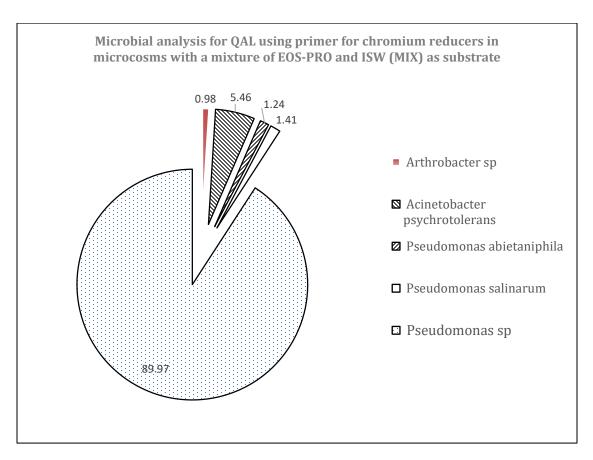


Figure 5.18: Microbial diversity for MIX microcosms in QAL using known primer for chromium reducing bacteria.

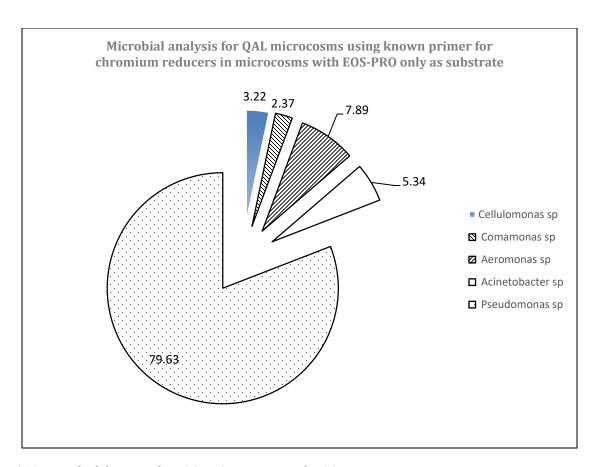


Figure 5.19: Microbial diversity for EOS-PRO microcosms for QAL.

5.1.2 Phase II Microcosms with a Mixture of EOS-PRO and Industrial Sugar Wastewater as Substrate (3 parts of EOS-PRO and 12 parts of Industrial Sugar Wastewater) and with Diammonium Phosphate

The set of microcosms shown in this section were prepared using a mixture of Industrial Sugar Wastewater and EOS-PRO. In addition, di-ammonium phosphate was added to supply nitrogen after all nitrate had been biodegraded. The experimental matrix used in these microcosm tests is depicted in Appendix E (Table E.6) and the experimental methodology is introduced in section 2.6.2.

Cr (VI) Degredation

Figure 5.20 shows the Cr (VI) reduction in QAL and UMCf microcosms. In QAL microcosms, the Cr (VI) was less than 1000 μ g/L by Day 4, while the Cr (VI) was still about

6000 μ g/L in UMCf microcosms. By Day 11, Cr (VI) in QAL was about 80 μ g/L and in UMCf was about 1000 μ g/L. The Cr (VI) was below detection limit in both the microcosms sampled on Day 18. In the preliminary microcosms, Cr (VI) was below detection the limit (< 10 μ g/L) only on Day 36 in Mix microcosms and on Day 11 in Industrial Sugar Wastewater microcosms. This highly biodegradable Industrial Sugar Wastewater is easily used up by bacteria and promotes fast reduction. In this experiment, the amount of Industrial Sugar Wastewater added to each microcosm bottle was 12% by volume; in the preliminary microcosms it was 5% by volume in Mix and 6% by volume in Industrial Sugar Wastewater only bottles.

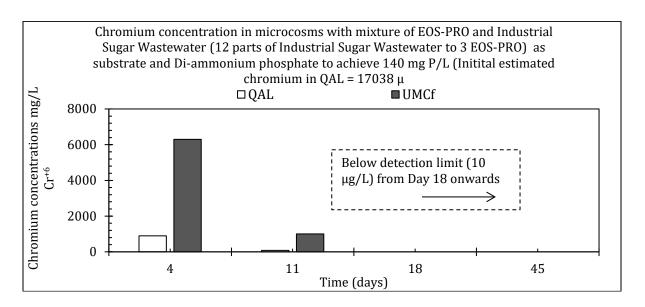


Figure 5.20: Cr (VI) concentrations in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

Microcosm COD Levels

The targeted COD in the microcosms was 12000 mg/L. The Day 4 COD was about 14000 mg/L in QAL and 13000 mg/L in UMCf microcosms. The cause of the increase between Days 1 and 4 was suspected to be caused by the COD in the Industrial Sugar Wastewater that is released as the biodegradable solids dissolve. The COD decreased gradually and COD was about 54% of the starting concentration in QAL microcosm and

50% in UMCf microcosms on Day 146. There was still significant COD remaining and therefore the microcosms were not limited by the availability of substrate.

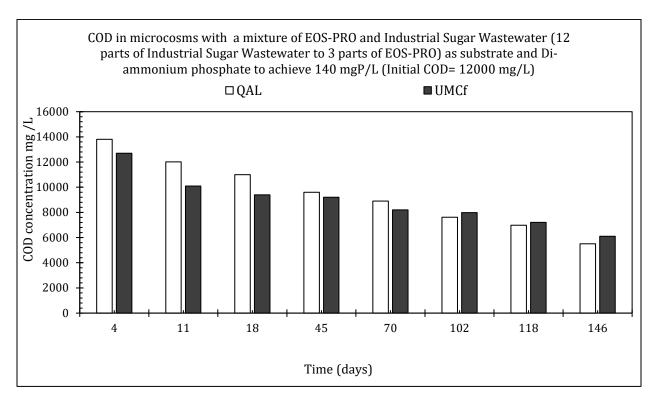


Figure 5.21: COD in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

Nitrate Reduction

Figure 5.22 shows the nitrate degradations in QAL and UMCf microcosms. In QAL microcosms, the nitrate was less than 60 mg/L as NO₃ and about 300 mg/L as NO₃ in UMCf microcosms by Day 45. By Day 70, nitrate was about 10 mg/L as NO₃ in QAL and remained about 300 mg/L as NO₃ in UMCf. The non-degradation of nitrate in the UMCf was unexpected, since degradation occurred in the preliminary microcosms. The non-degradation of nitrate (Figure 5.22), chlorate (Figure 5.23), and perchlorate (Figure 5.24) may have been caused by: (a) the presence of more Industrial Sugar Wastewater than in the preliminary microcosms, or (b) a very low level of bacteria in the soil. Supporting the first theory, in the preliminary microcosms it was also found that nitrate degradation was

much slower for microcosms containing only Industrial Sugar Wastewater as compared to those containing only EOS-PRO or a Mix of EOS-PRO and Industrial Sugar Wastewater. Supporting the second theory, although soil samples were refrigerated, the clayey nature of the UMCf caused the soil harden and pelletize in the refrigerator. The microcosm test described here was performed several weeks after the first, preliminary one. Microbial counts can be found at the end of this section, just before section 5.1.3.

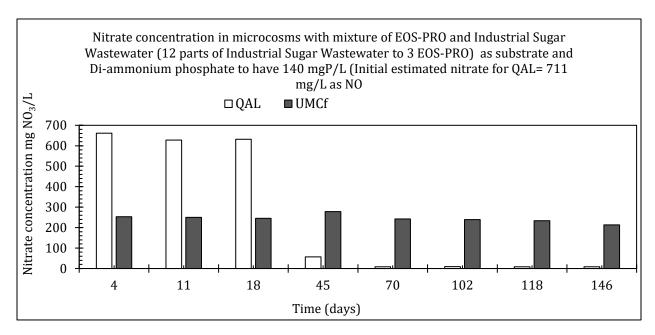


Figure 5.22: Nitrate concentration in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

Chlorate Reduction

Figure 5.23 shows the chlorate degradation in QAL and UMCf microcosms. In QAL microcosms, the chlorate did not degrade by Day 18, but was below detection limit on Day 45. In the preliminary microcosms with more oil and less Industrial Sugar Wastewater, chlorate degraded in QAL in the presence of EOS-PRO and the Mix, but did not degrade in the presence of Industrial Sugar Wastewater alone. The same was observed for UMCf in the preliminary microcosms, but chlorate degradation was much slower. In Phase II, performed with higher Industrial Sugar Wastewater added, no chlorate degradation was observed in the UMCf.

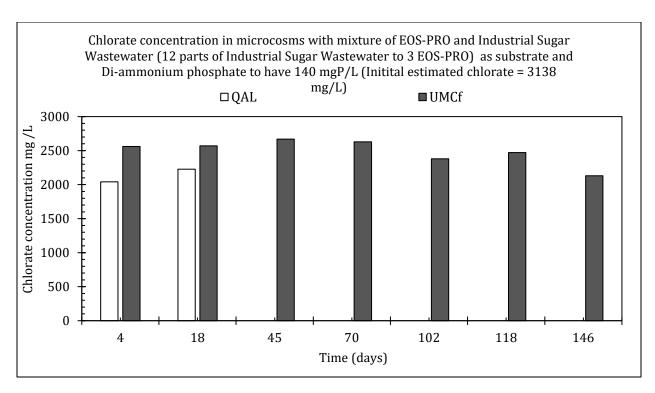


Figure 5.23: Chlorate concentration in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

Perchlorate Reduction

After 146 days of residence time, perchlorate degradation was not observed in either QAL or UMCf. In the preliminary microcosms, only minor degradation was observed after 99 days incubation. Interestingly, the UMCf microcosms presented evidence of a very reducing environment (e.g. very strong odor indicative of sulfate reduction) compared to QAL microcosms. The caps of some of the bottles puffed up (i.e. indicative of presence of methane), indicating the presence of gas. One can envision fermentation of the Industrial Sugar Wastewater, but cannot explain why that did not happen in the QAL bottles.

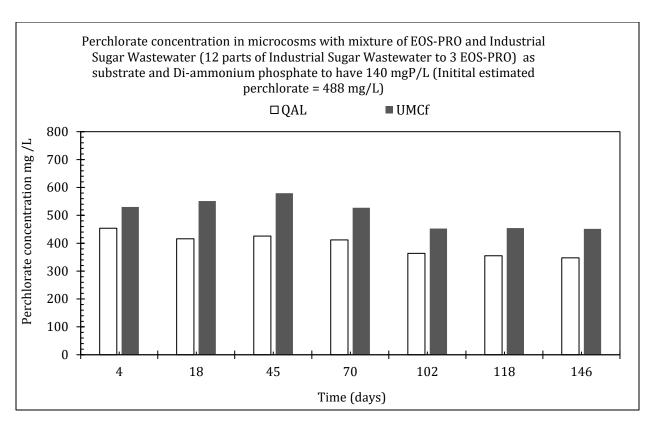


Figure 5.24: Perchlorate concentration in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

PH Levels

The pH levels in the microcosms were about one unit pH lower than that of the preliminary micirocosms, due to the higher amount of Industrial Sugar Wastewater added (Figure 5.25). Nonetheless, both QAL and UMCf exhibited pH values that are conducive to biological reduction of the contaminants of concern.

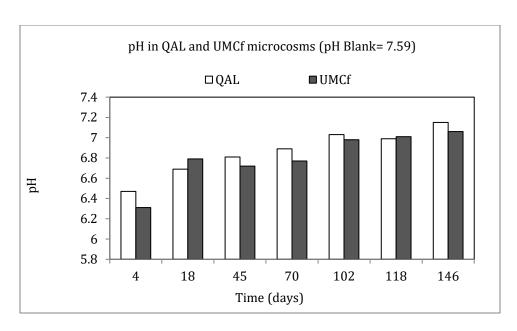


Figure 5.25: pH in the microcosms

Total Dissolved Solids (TDS) Levels

The TDS in the microcosms on Day 4 was 12000 mg/L in QAL and 10000 mg/L in UMCf (Figure 5.26). TDS was observed to increase gradually with time. Again, it is likely the high TDS might have played a role in the slower degradation observed, similar to that seen in the preliminary microcosms.

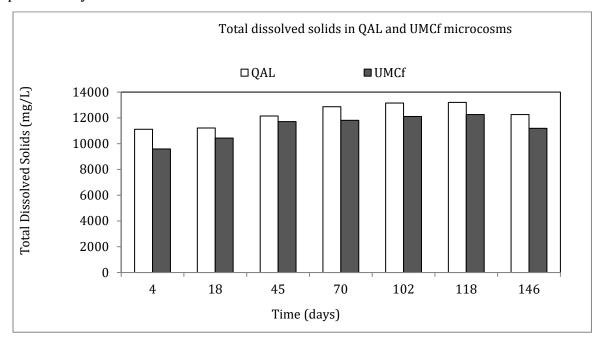


Figure 5.26: TDS in QAL and UMCf microcosms with a mixture of EOS-PRO and Industrial Sugar Wastewater as substrate.

Microbial Classification

The total number of bacteria present in the original soils, before adding substrate to the microcosms, was determined to be 2.07E+06 and 1.35E+04, for QAL and UMCf, respectively (Tables 5.3 and 5.4). Therefore, the QAL soil contained 153 times more bacteria than UMCf. As expected, the addition of a carbon substrate resulted in significant increase in the number of bacteria present. By Day 18, the number of bacteria increased approximately 230 times and 1,890 times for QAL and UMCf, respectively. However, with time the amount of bacteria present decreased; on Day 102, bacteria numbers in both UMCf and QAL had decreased by about 50%,

The diversity of bacteria in Phase II microcosms is depicted in Figure 5.27. The predominance of bacteria changed significantly between the original soil and the microcosms. While both QAL and UMCf soils where rich in *Pseudomonas* and UMCf also contained some *Phenylobacterium*, the microcosms on Day 18 contained completely different species. Notice that this finding is different from that of Phase 1 microcosms (Table 5.1), where *Pseudomonas* and *Acinetobacter* persisted during the testing period. A major difference between Phase I and Phase II microcosms was the freshness of the soil. Phase 1 microcosms were performed within two weeks of soil collection while Phase II, after six months of collection. Although the soils were kept refrigerated, the age of the samples may have played a role in the loss of *Pseudomonas* and *Acinetobacter*.

The majority of the bacteria in the QAL and UMCf microcosms was *Clostridium* beijerinskii, Corybacterium, or Sporolactobacillus nakayamae. However, on Day 102 the dominant species was identified as Rummeliibacillus suwonensis. There are several reports of nitrate, chromium, and other contaminant reduction by Clostridium and Pseudomonas (Inglett et al., 2011; Carlson and Ingraham, 1983; Dogan et al., 2011; Megharaj et al., 2003; Nguema and Luo, 2012). Corynebacterium has been identified as a chromium tolerant species (Viti et al., 2001). Rummeliibacillus suwonensis is a rare bacterium. Its role in biodegradation is not established, but it has been identified in soils (Her and Kim, 2013). It

is important to note that the vast majority of bacteria identified in the microcosms are spore forming—that is, they are bacteria that thrive under unfavorable conditions.

Table 5.3: Microbial Numbers and Diversity for the Phase II QAL Microcosms Using Universal Primer

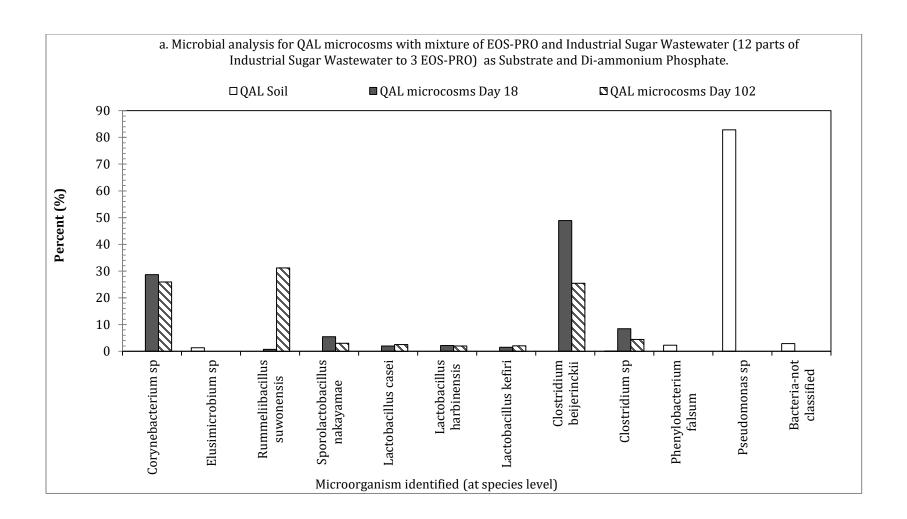
QAL microcosms

QAL Soil			Day 18		Day 102	
Organism/ g soil	2.07E+06	4.82E+0	8	2.37E+08		
	Pseudomonas sp	82.84 %	Clostridium beijerinckii	48.92 %	Rummeliibacillus suwonensis	31.19 %
	Phenylobacterium falsum	2.27 %	Corynebacterium sp	28.69 %	Corynebacterium sp	25.95 %
Classification of bacterial species	Elusimicrobium sp	1.30 %	Clostridium sp	8.47 %	Clostridium beijerinckii	25.44 %

Table 5.4: Microbial Numbers and Diversity for the Phase II QAL Microcosms using Primer Specific for Chromium Reducing Bacteria

UMCf microcosms

	UMCf Soil		Day 18		Day 102		
Organism/ g soil	1.35E+04		2.55 E+07	2.55 E+07		1.31E+07	
	Pseudomonas sp	23.57 %	Corynebacterium sp	28.85 %	Rummeliibacillus suwonensis	42.24 %	
	Phenylobacterium sp	19.27 %	Sporolactobacillus nakayamae	26.99 %	Clostridium beijerinckii	15.14 %	
Classification of bacterial species	Unclassified	18.00 %	Clostridium beijerinckii	24.39 %	Sporolactobacillus nakayamae	14.33 %	



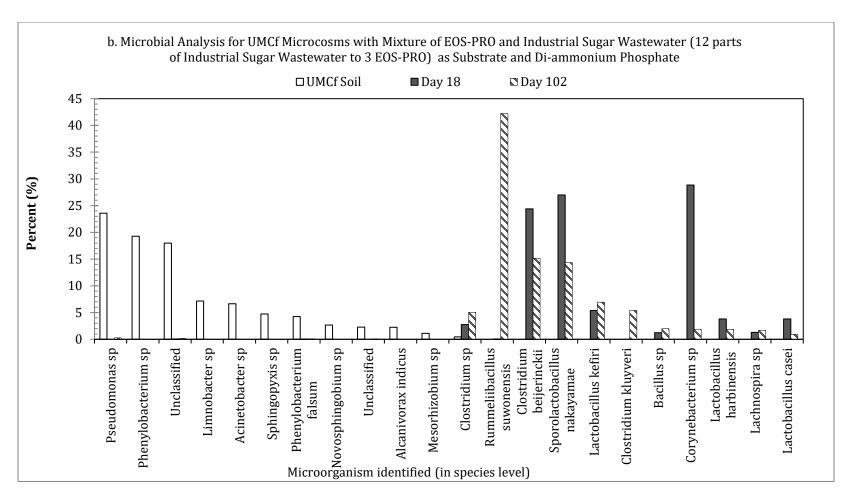


Figure 5.27: Microbial diversity for MIX microcosms for QAL (a) and UMCf (b) microcosms.

5.1.3 Microcosms with a Mixture of EOS-PRO and Sugar as Substrate to Substitute for Industrial Sugar Wastewater

This set of microcosms was an addition to the original plan with the goal of finding another suitable soluble substrate to mix with EOS-PRO. The reason is that the Industrial Sugar Wastewater may not be a reliable source of substrate in the future. Table E.7 in Appendix E depicts the experimental matrix used in these microcosm tests and the methodology is explained in section 2.6.3. Figure 5.28 shows the COD in the filtered samples from the microcosms for Day 4 and Day 10. The COD values are similar to those obtained with the mixture of Industrial Sugar Wastewater and EOS-PRO. The COD were almost the same on Day 4 as the initial concentrations, but were reduced by 33% in QAL and 16% in UMCf on Day 10 (Figure 5.28). No Cr (VI) degradation was observed on Day 4, but 50% of Cr was reduced by Day 10 (Figure 5.29) in both QAL and UMCf. This degredation rate is much slower compared to the other substrates presented in previous sections (5.1.1 and 5.1.2).

No nitrate, perchlorate, and chlorate degradation were observed, as shown in Table 5.5. Phosphate concentration was similar to the initial estimated phosphate on Day 10. The sugar and EOS-PRO microcosms were discontinued after 10 days because the Cr (VI) degradation was slower compared to Industrial Sugar Wastewater, Mix, EOS-PRO and Molasses microcosms. Therefore, sugar is not as effective a substrate as the Industrial Sugar Wastewater which contains—in addition to sugar—protein and carbohydrate.

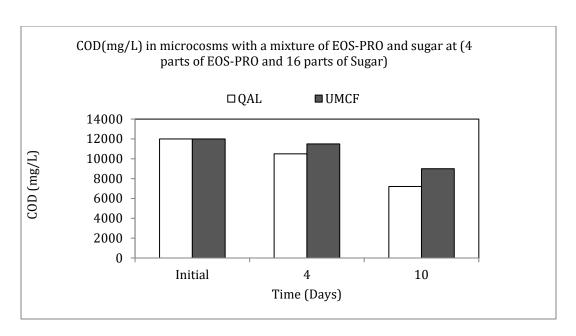


Figure 5.28: COD in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar as substrate.

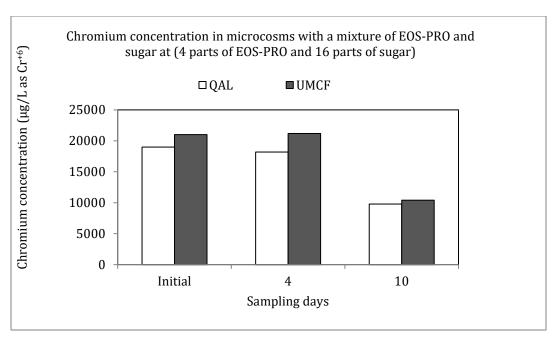


Figure 5.29: Cr (VI) in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar as substrate.

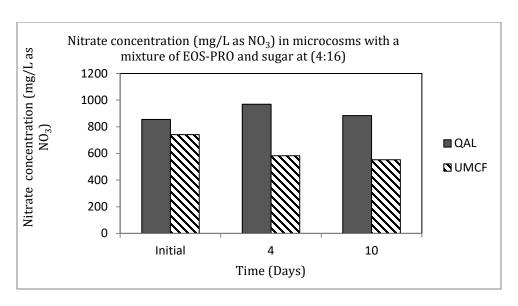


Figure 5.30: Nitrate in QAL and UMCf microcosms with a mixture of EOS-PRO and sugar as substrate.

Table 5.5: Concentrations of nitrate, perchlorate, chlorate and phosphate in the microcosms with EOS-PRO and sugar (4:16)

	Nitrate			Perch	Perchlorate Chlorate		ate	te Phosphate		
	Initial			Initial		Initial		Initial		
Microcosm	estimate	Day 4	Day 10	estimate	Day 10	estimate	Day 10	estimate	Day 10	
QAL	855	968.768	884.520	488	485.655	3138	2998.361	140	135	
UMCF	740.9	582.940	552.614	642	551.3651	3136	3159.236	220	198	

5.2 Column Biological Test

The biological reduction of chromium and co-contaminants was evaluated using four columns. Two of the columns were packed with soil from depths 25-30 ft (Quaternary Alluvial layer) termed QAL columns and two with soil from 35-40 ft (Muddy Creek Formation) termed UMCf columns. The operation details for the UMCf and QAL columns are shown in Table 2.7. The column feed solution composition was changed with time. Compositions included groundwater (GW) with EOS-PRO, a mixure of Industrial Sugar Wastewater and EOS-PRO, and GW alone. The full methodology for the column biological tests can be found in section 2.7.

The flow rates during the first four days of the run were 2.6 ± 1.2 mL/min and 1.5 ± 0.50 mL/min for columns QAL A and QAL B, respectively. From Day 5 onwards, the flowrates were 0.16 ± 0.17 mL/min on average in QAL A (ranging from 0.03 mL/min to 0.81 mL/min) and 0.14± 0.22 mL/min on average in QAL B (ranging from 0.01 mL/min to 1.51 mL/min). As mentioned earlier, this decrease in flowrate was caused by transport of the fine materials of QAL to the bottom of the column. For the UMCf columns, the flowrates were steadier throughout the study period and ranged from 0.14 to 0.18 mL/min. The flow rate and the contact time (CT) in the QAL and UMCf columns are shown in Table 5.6. The contact times in the columns varied from 8.9-10.6 days for QAL and 5.2-7.2 days for UMCf. Note that the UMCf column was run at 10 psi pressure while the QAL columns were run at 5 psi.

The data collected by Tetra Tech during the pilot field test show hydraulic conductivities in QAL (S wells) in the 10-3 to 10-4 cm/sec (2.5 -25 ft/day) range while the UMCf (D wells) had hydraulic conductivities one to two orders of magnitude lower, 10-5 and 10-6 cm/sec (0.25-0.02 ft/day). Therefore, for the approximately 46 inches of soil used in the columns—and assuming average field hydraulic conductivities—the contact time in the QAL and UMCf would vary from 1.5-15 days and from 15-190 days, respectively. Actual contact times measured in QAL during the laboratory tests varied from 8.9 to 10.6 days and are within the higher end of the range of QAL contact times in the field (1.5-15 days). However, the contact times observed in the laboratory for UMCf (5.2 to 7.2 days) are much

shorter than those expected in the field (15-190 days). The reason is that the low hydraulic conductivity of the UMCf required higher pressure to facilitate flow within the time frame allocated for the project. As a consequence, field experiments will need much longer for UMCf bioremediation than the time reported here. However, contaminant removal is expected to be better because of the larger contact time in the aquifer. In summary, biodegradation results for QAL found in the laboratory are likely to follow very closely what will be observed in the field. However, UMCf bioremediation will take longer in the field and is limited by the slow groundwater velocity. Compared to the values found in the laboratory, final contaminant concentrations of UMCf—despite the longer time required—are likely to be much smaller than the ones found in the laboratory.

Table 5.6: Contact times (days) for the groundwater in the QAL and UMCf columns.

	Operational Period	QAL-Column A			QAL-Column B			UMCf-Column A			UMCf-Column B		
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Contact Times (days)	Overall period	8.92	0.87	28.07	10.6	0.47	23.66	7.16	2.45	13.62	5.22	1.75	12.76
	High amount of substrate (comparing the impact of Industrial Sugar Wastewater, no substrate and EOS-PRO alone)	8.36	0.31	20.53	10.6	0.47	23.66	3.78	2.21	5.63	2.85	1.52	4.29
	Low amount of substrate	8.95	2.06	28.07	13.19	1.54	80.7	9.15	4.02	13.62	6.62	3.14	12.76
Flow rate (mL/min)	Overall period	0.16	0.03	0.81	0.14	0.01	1.51	0.13	0.05	0.29	0.17	0.06	0.40
	High amount of substrate (comparing the impact of Industrial Sugar Wastewater, no substrate and EOS-PRO alone)	0.33	0.03	2.29	0.28	0.03	1.59	0.20	0.12	0.32	0.27	0.16	0.46
	Low amount of substrate	0.11	0.03	0.34	0.10	0.01	0.45	0.09	0.05	0.17	0.12	0.06	0.22

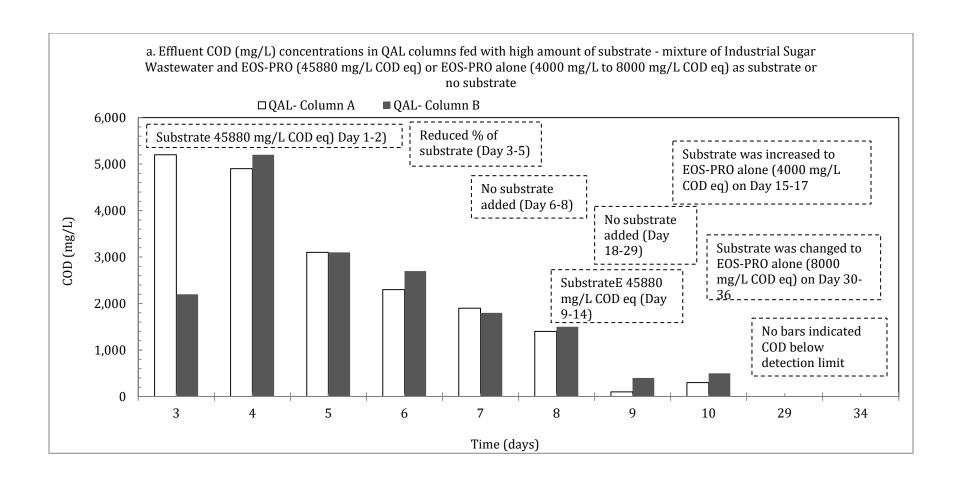
5.2.1 COD Measurements

The effluent COD measurements from QAL columns when feeding high concentrations of substrate (45880 mg/L COD eq) are presented in Figure 5.31 (a). Notice that the effluent COD concentration is below 5,000 mg/L in Column A and below 2000 mg/L in Column B due to absorption of EOS-PRO in the soil. From Day 3 to Day 5, the feed was diluted with more groundwater and the COD in the effluent gradually decreased to below 500 mg/L. The addition of EOS-PRO only (at 4000 mg/L = 8000 mg/L COD eq) resulted in no COD in the effluent. This occurred because of the time it takes for the substrate to pass through the column. Note that during the period where COD was not observed, Cr (VI) and nitrate degradation were also not detected (Figure 5.33 (a) and 5.36 (a), respectively).

Figure 5.31 (b) shows the effluent COD for low substrate (9260 mg/L COD eq) in the QAL columns. The COD values were between 200 to 400mg/L, except Day 81, Day 101, and Day 108 in QAL Column A and Day 55, Day 77, Day 79, and Day 83 in QAL Column B. On Day 108, the COD nearly doubled in both columns which was expected considering power outage and crack formation in the columns. The high COD values, about 1300 mg/L, on Day 143 (in jut column QAL A) and Day 160 (in both columns) were not expected considering Cr (VI), nitrate, chlorate, and perchlorate degradation.

Figure 5.32 (a) shows the effluent COD in the UMCf columns at high substrate (45880 mg/L COD eq). In the beginning when the columns were fed at 45880 mg/L COD eq, the lower values of COD in the effluent (about 4000 to 5000 mg/L) might have been due to adsorption of EOS-PRO in the soil. After reducing the feed by diluting with more groundwater from Day 8 to Day 10, the COD in the effluent gradually decreased from Day 12. By Day 14, the COD was below 500 mg/L. After adding EOS-PRO at 45880 mg/L again, the effluent COD started to increase. Upon changing the feed to EOS-PRO only on Day 20 (4000 mg/L as COD eq), the COD decreased below 200 mg/L. Upon increasing the feed to 8000 mg/L as COD eq (EOS-PRO only) on Day 30, the effluent COD was below detection limit on Day 39 indicating COD was not sufficient for degradation.

For the UMCf columns, Cr (VI) and nitrate degradation were also not observed during this period with no COD detected (Figure 5.34 (a) and 5.38 (a), respectively). Figure 5.32 (b) shows the COD for low substrate (9260 mg/L COD eq) in the UMCf columns. In column A, the COD values were between 100 to 600 mg/L until Day 82 and remained below 400 mg/L throughout the study period. The COD values were between 100 to 600mg/L throughout the study in Column B, except for Day 137 when the COD was about 75 mg/L.



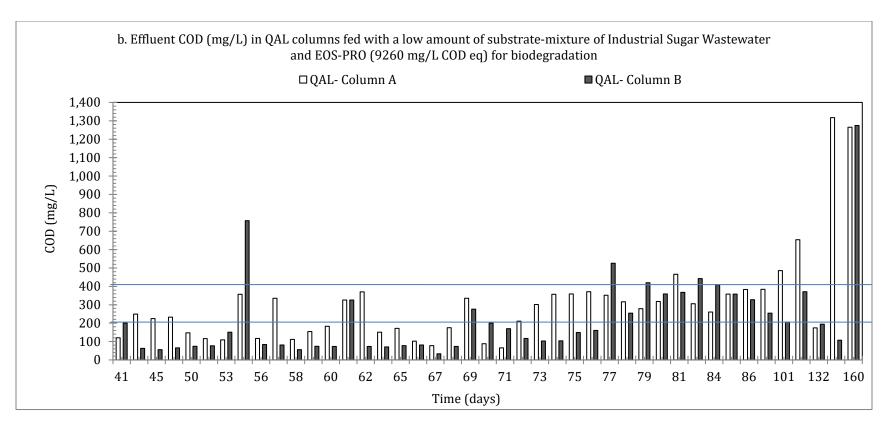
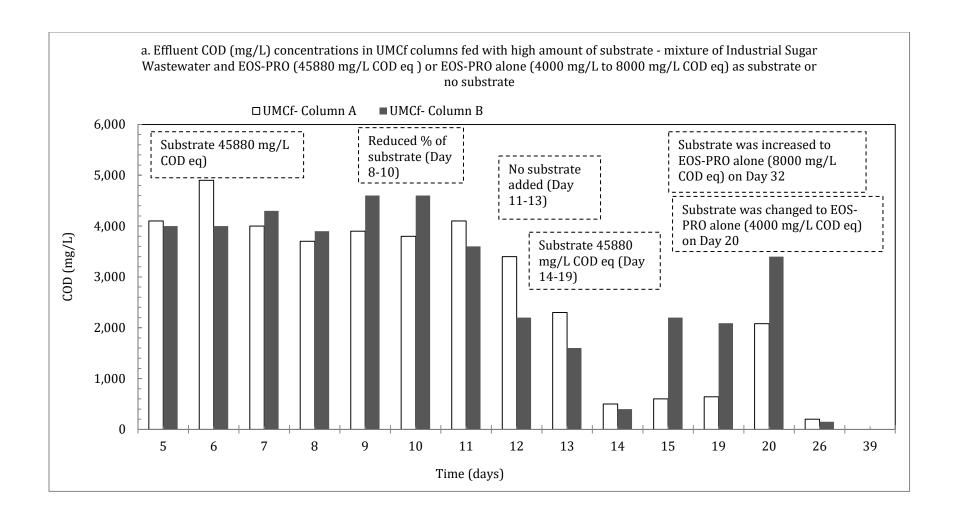


Figure 5.31: COD in the QAL columns- a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2% by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at 0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent hexavalent chromium concentration in the columns were 14261 \pm 1987 μ g/L (a) and 12377 \pm 997 μ g/L (b) over the operation periods. (The horizontal lines are drawn to clarify the 200 mg/L and 400 mg/L COD levels).



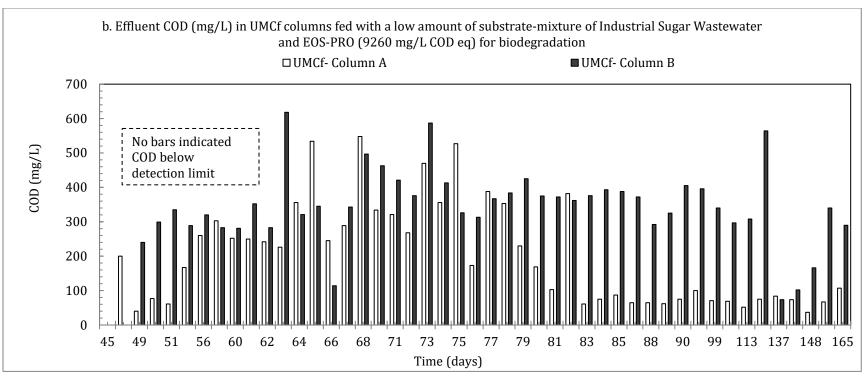


Figure 5.32: Effluent COD in the UMCf columns fed with a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2% by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at 0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent hexavalent chromium concentration was $17385 \pm 1829 \,\mu\text{g/L}$ (a) and $15360 \pm 1325 \,\mu\text{g/L}$ (b) over the operation periods.

5.2.2 Cr (VI) Reduction

Figures 5.33 (a) and (b) show biological Cr (VI) reduction in the QAL columns in the presence of (a) high substrate then no substrate addition (45,880 mg/L COD equivalent and varying amounts of substrate) and (b) low (9260 mg/L COD equivalent) amounts of influent substrate concentration. The EOS-PRO oil and Industrial Sugar Wastewater added as substrates were absorbed into the soils (See COD section 5.1.1) generating COD values in the effluent of the column that were between 2,000-5,000 mg/L COD and < 300 mg/L COD under high and low substrate conditions, respectively. The COD provided by the EOS-PRO and the Industrial Sugar Wastewater were used as energy and carbon sources by bacteria to reduce Cr (VI) and other contaminants present in the groundwater.

The Cr (VI) in the effluent from the QAL columns decreased by half by Day 3, and continuously decreased with time (Figure 5.33 a). On Day 9, the chromium concentration increased slightly, but after adding a mixture of Industrial Sugar Wastewater and EOS-PRO (45880 mg/L COD eq) substrate on Days 9 to 14, the chromium concentration decreased steadly and was below detection limit in the effluent on Day 14. The reduction in substrate to 4000 mg/L COD eq (EOS-PRO) did not negatively impact the chromium reduction indicating the lower substrate concentration was sufficient to promote Cr (VI) reduction.

When no substrate was added for almost 11 days, the Cr (VI) concentration remained below detection limit in the effluent due to the residence time of the substrate within the QAL column. That is, substrate was still available within the column to promote degradation. As mentioned earlier, the average residence time in QAL columns varied from 8.9 and 10.6 days. Therefore, the breakthrough of Cr (VI) after 11 days of no substrate addition suggests the remaining sorbed substrate in the column was consumed after 11 days. After 11 days of addition of substrate to the column, the effluent Cr (VI) concentrations were 500 μ g/L on Day 29 in Column A and 20 μ g/L on Day 30 in Column B. The effluent chromium concentrations remained high (about 10000 μ g/L in Column A and about 2000 μ g/L in Column B) on Day 32 even after addition of substrate (8000 mg/L COD eq, EOS-PRO only). After Day 46, COD concentrations as low as 100 mg/L in the effluent (Figure 5.31) were sufficient to keep Cr (VI) levels undetected.

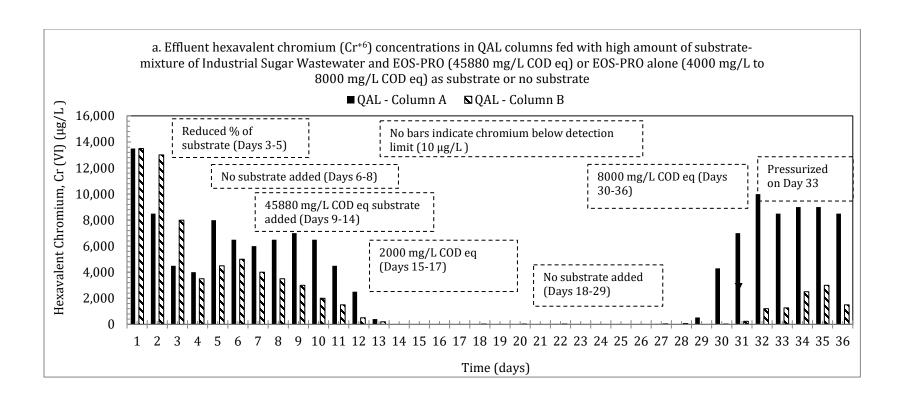
In summary, the results demonstrate the following:

- (a) Cr (VI) reduction in NERT groundwater starts very quickly (in less than three days) when substrate is available—therefore naturally occurring chromate-reducing bacteria are present,
- (b) both EOS-PRO and Industrial Sugar Wastewater are good substrate sources.
- (c) when substrate addition is stopped, biological reduction was maintained possibly by the remaining substrate in the pore of space of the soil and is therefore dependent on the groundwater residence time,
- (d) effluent concentrations as low as 100 mg/L COD were sufficient to keep Cr (VI) levels undetected; therefore, depending on the other contaminants present, this COD value could be used as a tool in this location to indicate need for reinjection of substrates, and
- (e) field application for in-situ Cr (VI) reduction at NERT will be controlled by the velocity of the groundwater (i.e., contact time), the porosity of the soil, and the substrate concentration available for degradation.

Microcosms testing results discussed in section 5.1 revealed that the addition of EOS-PRO alone as a substrate promotes slower Cr (VI) reduction than that fostered by a mixture of EOS-PRO and Industrial Sugar Wastewater. The results seem to indicate that the addition of readily biodegradable Industrial Sugar Wastewater promoted faster degradation of Cr (VI), either due to chemical or biological reduction. Therefore, in the column tests, a low amount of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO at 9260 mg/L COD eq) was added on Day 37. The effluent chromium concentrations decreased gradually to below detection limit by Day 45 (Figure 5.33 b). The COD values in the effluent during this period (Days 37-45) were below 300 mg/L as compared to 2000-5000 mg/L observed within the first fifteen days of the column running; this indicates that much lower COD values are sufficient to promote Cr (VI) removal.

The effluent Cr (VI) concentration on Day 108 increased to 900 μ g/L in QAL column A and 2600 μ g/L in QAL Column B. On Day 113, the Cr (VI) concentrations were 3200 μ g/L and 3300 μ g/L in Columns A and B, respectively. It was suspected that the increase in the

Cr (VI) was because of the power outage that caused a crack in the media, causing microchanneling. Once the columns were pressurized again, the microcracks were resolved. On Day 118, the Cr (VI) concentration was below 20 μ g/L in both columns—suggesting the increase on Day 113 was because of the disruption. For rest of the period, the Cr (VI) fluctuated from below detection limit to 60 μ g/L in both columns, demonstrating biological removal of Cr (VI) fron NERT groundwater is feasible and can be sustained for a long period of time. The biological process was not observed to cause any clogging in the columns. However, reduced flow rate was observed early in QAL columns due to displacement of the fine materials contained in QAL to the bottom of the columns.



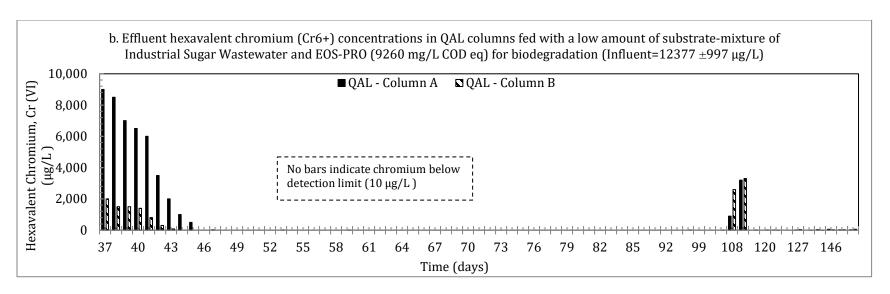


Figure 5.33: Effluent Cr (VI) concentrations in the QAL columns- a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2% by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at 0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent hexavalent chromium concentration in the columns were $14261 \pm 1987 \,\mu\text{g/L}$ (a) and $12377 \pm 997 \,\mu\text{g/L}$ (b) over the operation periods.

Note: The influent Cr (VI) concentrations were lower than actual concentration in the groundwater which was suspected to be due to possible chemical or biodegradation in the feed tank due to Industrial Sugar Wastewater (Appendix E)—despite changing the feed bottle and groundwater every day. During the first two weeks of operation, the influent feed groundwaters were wrapped with a few ice packs, but the ice packs were not enough to maintain the desired 4°C temperature. This issue was corrected by using Velcro to attach more ice packs close to the influent bottle. In addition, in the influent that contained Industrial Sugar Wastewater potential abiotic reduction may have occurred—as explained earlier. Also, Appendix E shows that Industrial Sugar Wastewater has chemical abiotic reduction potential. Those influent readings are not considered for statistical analysis. From Day 15, the influent chromium was measured immediately after preparing the feed which improved the reading. Also, the feed groundwater bottles were surrounded with more ice packs, as mentioned earlier.

Figures 5.34 (a) and (b) show the Cr (VI) reduction in the UMCf columns fed with high and low amounts of substrate, respectively. Cr (VI) in the effluent from the UMCf columns decreased by 25% by Day 4, and continuously decreased even when the substrate addition was gradually reduced (Figure 5.34 a). After reinitiating feeding of substrate into the columns, it took some time for Cr (VI) reduction to start again. With a feed of 45880 mg/L COD equivalent (mixture of Industrial Sugar Wastewater and EOS-PRO) on Day 14, it took five days (Day 19) for the effluent Cr (VI) concentration to decrease below the detection limit. The reason is the slow velocity of water in the columns; recall that the estimated contact time for the UMCf columns ranges from 5.2 to 7.2 days. Therefore, the lag time between feeding time and chromium reduction relates to the time it takes for the substrate to pass through the column pores.

The feed substrate was reduced to 4000 mg/L COD eq (EOS-PRO only) on Day 20. As noted in the COD discussion, the effluent COD levels for the UMCf columns after Day 20 remained below detection limit until Day 45 (Figure 5.32). After Day 45, the levels started increasing and reached above 300 mg/L. For UMCf column A, COD values dropped below 100 mg/L after Day 83 (Figure 5.32).

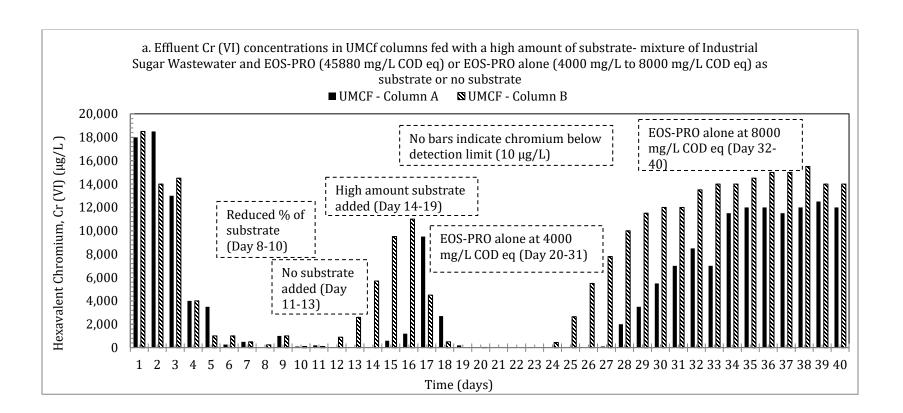
The chromium concentration remained below detection limit in the effluent until Day 29 in Column A and Day 24 in Column B. The substrate was increased to 8000 mg/L COD eq (EOS-PRO only) on Day 32. Despite this increase, the effluent chromium concentrations remained around 14000 μ g/L in Column A and about 16000 μ g/L in Column B. As COD in the effluent increased, Cr (VI) was observed and it decreased with time until reaching non-detectable levels by Day 97.

The effect of adding a low amount of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO at 9260 mg/L COD eq on Day 41) on effluent chromium concentrations is depicted in Figure 5.34 (b). The effluent chromium concentrations decreased gradually, were halved by Day 53, and were below detection limit by Day 95 (Figure 5.34 b). For UMCf A, cracks were not visible on Day 106 after the power cut, but a small crack was noticed on Day 116 in column UMCf B. On Day 120, the effluent chromium concentration in column B increased to 420 μ g/L and on Day 125 was 3500 μ g/L. This increase in concentration may be due to channeling caused by the cracking. Because the

columns were operated under pressure—and given the clayey nature of the soil—small cracks slowly closed after repressurizing the columns. After Day 125, the effluent chromium concentration gradually decreased and was below detection limit after Day 148.

Although the influent chromium concentrations varied—because samples were taken at different times and different wells—Cr (VI) reduction was was observed in both QAL and UMCf soils every time sufficient substrate was available.

When comparing the performance of QAL and UMCf for Cr (VI) removal, the QAL columns performed better—reaching nondetectable levels (< $10~\mu g/L$) after Day 45 of operation. The UMCf columns, fed the same COD equivalent of 8000 mg/L, reached stable non-detect by Day 90. This observation may reflect the fact that contact times in the UMCf columns were 5.2-7.2 days, as compared to 8.9 to 10.6 days in the QAL columns. Considering the QAL contact time was roughly twice as long, better degradation performance was expected. However, in the field, UMCf contact times will be longer and better performance is expected than for QAL under the same substrate feed conditions.



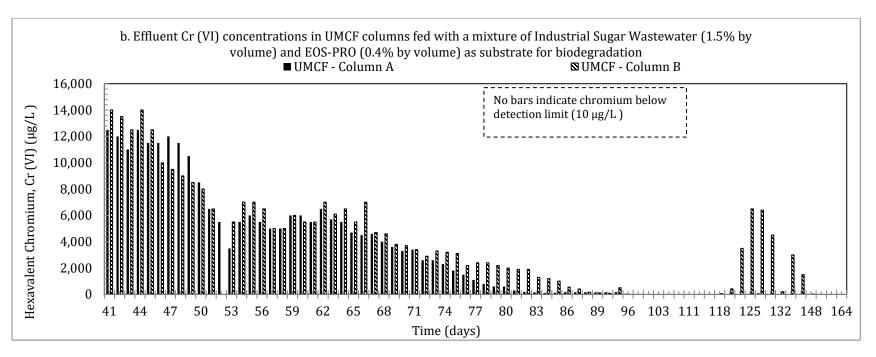


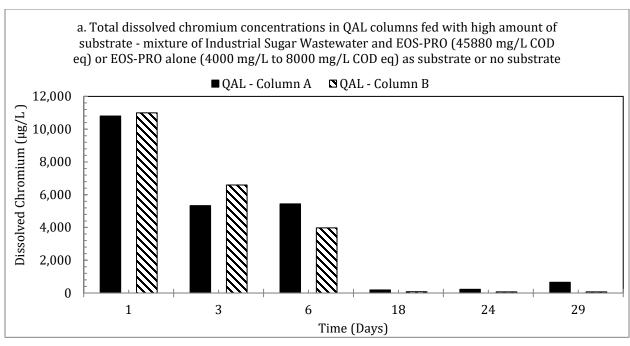
Figure 5.34: Effluent Cr (VI) concentrations in the UMCf columns fed with: a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2% by volume) with 45880 mg/L COD eq, no substrate and EOS-PRO alone at 0.2% (4000 mg/L COD eq) and 0.4% (8000 mg/L COD eq) (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) with 9260 mg/L COD eq (b). The average influent hexavalent chromium concentration was $17385 \pm 1829 \, \mu \text{g/L}$ (a) and $15360 \pm 1325 \, \mu \text{g/L}$ (b) over the operation periods.

Note: The influent Cr (VI) concentrations were lower than actual concentration in the groundwater which was suspected to be caused by possible chemical or biodegradation in the feed tank due to Industrial Sugar Wastewater (Appendix E)—despite changing the feed bottle and groundwater every day. During the first two weeks of the operation, the influent feed groundwaters were wrapped with a few ice packs, but the ice packs were not enough to maintain the desired 40C temperature. This issue was corrected by using Velcro to attach more ice packs close to the influent bottle. In addition, in the influent that contained Industrial Sugar Wastewater, potential abiotic reduction may have occurred, as explained earlier. Also, Appendix E shows that Industrial Sugar Wastewater has chemical abiotic reduction potential. Those affected influent readings are not considered for statistical analysis. From Day 15, the influent chromium was measured immediately after preparing the feed which improved the reading. Also, the feed groundwater bottles were surrounded with more ice packs, as mentioned earlier.

5.2.3 Dissolved Chromium Measurements

Figure 5.35 and Figure 5.36 show the dissolved chromium in QAL and UMCf columns, respectively. The dissolved chromium data followed the trend of Cr (VI) over the study period at high and low amounts of substrate. The dissolved chromium concentrations were measured in a 24-hour composite sample while the Cr (VI) was measured in grab samples—though the measurements were taken at the same time. Hexavalent chromium was measured in filtered samples using the HACH Method while total dissolved chromium was measured by ICP on settled (not filtered) samples taken from the effluent. Total dissolved chromium concentrations were measured for several days of testing, but not for all days.

Dissolved chromium in QAL columns fed high amount of substrate was reduced by half by Day 3. On Day 18, the dissolved chromium had fallen to about 200 μ g/L in Column A and below 100 μ g/L in Column B. In Column B, it remained below 100 μ g/L until Day 29 (Figure 5.35 a). Dissolved chromium in QAL columns on Day 38 at a low amount of substrate (the mixture with Industrial Sugar Wastewater and EOS-PRO) was about 7000 μ g/L in Column A and 1000 μ g/L in Column B (Figure 5.35 b). The dissolved chromium in the QAL columns decreased below 2000 μ g/L in Column A and 200 μ g/L in Column B by Day 43 (five days after starting the low amount of substrate mixture). The total dissolved chromium concentrations show similar trends to those described for hexavalent chromium and show the impact of substrate level on Cr (VI) reduction.



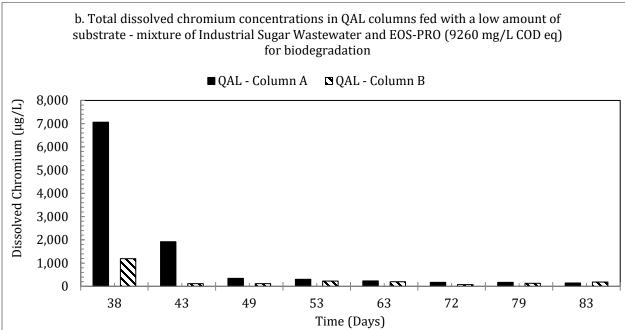
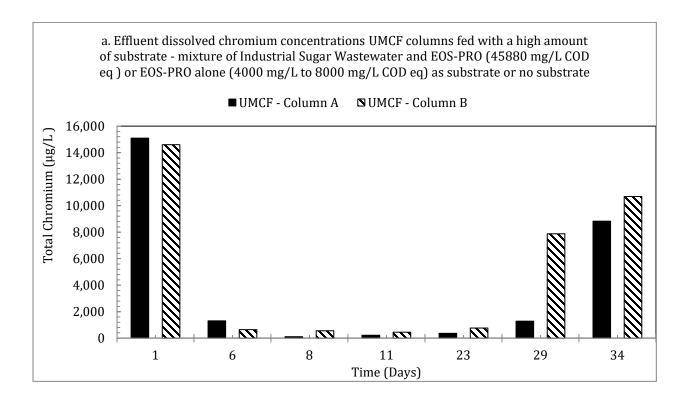


Figure 5.35: Total dissolved Chromium in the QAL columns fed with - a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2%), no substrate and EOS-PRO alone at 0.2% and 0.4% (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) (b).

Total dissolved chromium concentrations in the UMCf columns show the same trend as the Cr (VI) data described previously for the UMCf columns. The dissolved chromium in

UMCf columns at high amount of substrate was reduced to a seventh by Day 6—about 2000 μ g/L in Column A and 1000 μ g/L in Column B—and remained below 1000 μ g/L in both UMCf columns until Day 29 (Figure 4.36 a). As expected, the dissolved chromium increased to 10000 μ g/L while the columns were fed with 0.4% EOS-PRO. Dissolved chromium in both UMCf columns on Day 48 (at low amount of substrate, the mixture with Industrial Sugar Wastewater and EOS-PRO) was about 8000 μ g/L (Figure 4.36 b). On Day 54, the dissoved chromium was about 7000 μ g/L in Column A and 6000 μ g/L in Column B. The dissolved chromium in the UMCf columns gradually decreased below 200 μ g/L in Column A and 500 μ g/L in Column B by Day 88.



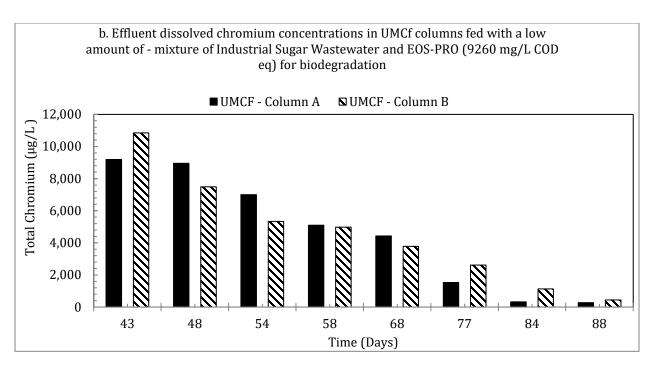


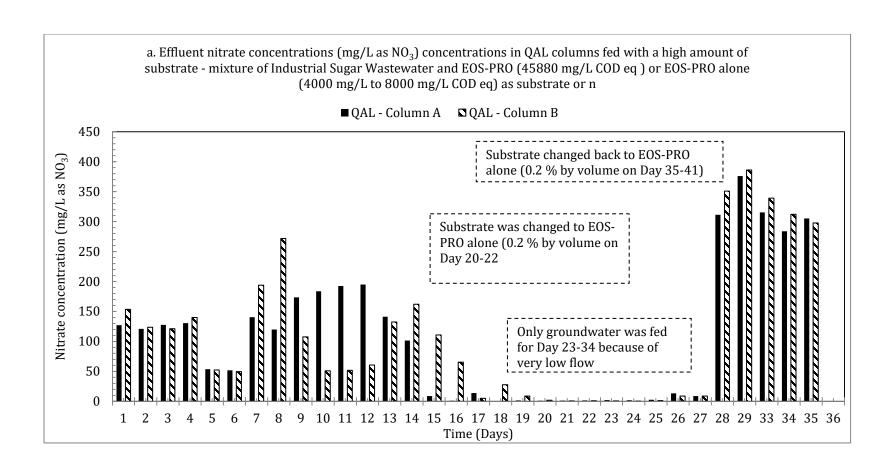
Figure 5.36: Dissolved chromium concentrations in the UMCf columns fed with- a high amount of substrate (mixture of Industrial Sugar Wastewater at 7% and EOS-PRO at 2%), no substrate and EOS-PRO alone at 0.2% and 0.4% (a) and a low amount of substrate (mixture of Industrial Sugar Wastewater at 1.5% and EOS-PRO at 0.4%) (b).

5.2.4 Nitrate Concentrations

Figure 5.37 and Figure 5.38 show the nitrate concentration in QAL columns and UMCf columns, respectively. The results show the impact of Cr (VI) on nitrate reduction. Figure 5.37 (a) shows the nitrate concentration in QAL columns for high amounts of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO). As mentioned earlier, the initial nitrate influent and effluent concentrations (150 mg/L as NO₃) were lower than the groundwater (400 mg/L as NO₃). The lower nitrate values observed during the first days were likely the impact of degradation in the feed bottle (used by the chromium reducing bacteria for growth or/and nitrate biodegradation). Nitrate biodegradation started on Days 5 and 6—the nitrate effluent concentration was about 50 mg/L as NO₃ in both columns (note that Cr (VI) reduced below 1000 μ g/L on Day 5). On Day 7, as new feed was added, the effluent nitrate concentration was observed to be about 200 mg/L as NO₃. During the period of no substrate addition, the nitrate concentrations fluctuated between

50 and 200 mg/L. On Day 14, a high amount of substrate mixture was added. Nitrate degradation was observed on Day 15, with concentrations below 5 mg/L as NO₃ by Day 20. Nitrate concentration increased to about 350 mg/L as NO₃ on Day 28, after 9 days of no substrate addition. During the same period, Cr (VI) also increased to about 500 μ g/L on Day 29 and continued to increase up to about 16000 μ g/L. The results reveal that nitrate degradation is impacted by the presence of Cr (VI). Chromium degradation is observed to occur first; however, when chromium decreases to lower levels, nitrate and chromium are reduced concomitantly. For the QAL columns, complete nitrate degradation lagged about 5 days behind chromium reduction (Day 14 for Cr (VI) and Day 19 for nitrate). Similar to that observed for Cr (VI), nitrate levels increase when substrate levels decrease.

Figure 5.37 (b) shows the nitrate concentrations in QAL columns fed with low amount of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO). The effluent nitrate concentration was about 300 mg/L as NO₃ until Day 40. On Day 41, the concentration decreased slightly (about 200 mg/L as NO₃), and concentration was below 20 mg/L as NO₃ on Day 148. Note that the Cr (VI) concentration was below 1000 μ g/L by Day 44. These data indicate that nitrate and Cr (VI) reduction occur at the same time.



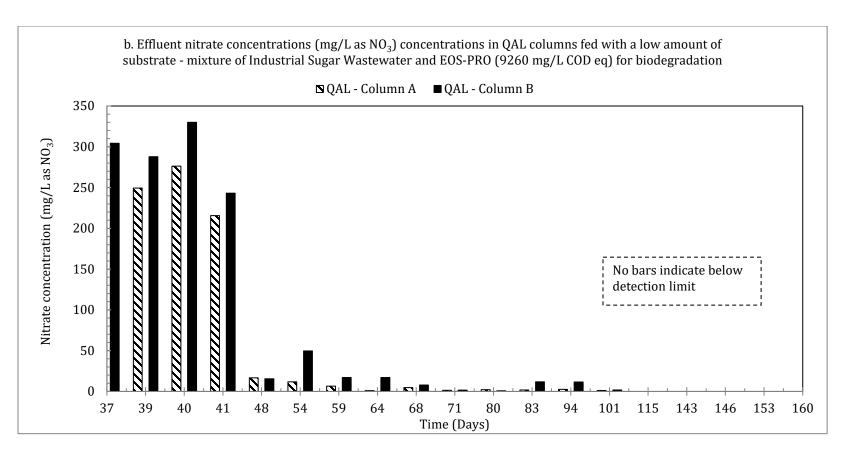
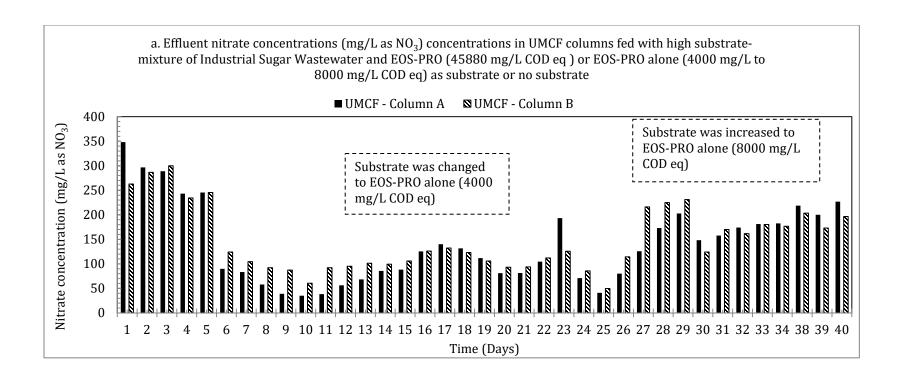


Figure 5.37: Effluent nitrate concentrations in the QAL.

Figure 5.38 (a) shows the effluent nitrate concentrations in UMCf columns fed with high amount of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO). Biodegradation was observed on Day 5; the nitrate effluent concentration was about 100 mg/L as NO₃ in both columns (note that Cr (VI) reduced below $1000\mu g/L$ on Day 5). The effluent concentration gradually increased after Day 11, but remained below 150 mg/L as NO₃ until Day 27. On Day 28, nitrate concentrations increased to about 250 mg/L as NO₃ (note that the Cr (VI) increased to about 500 $\mu g/L$ on Day 29 and continued to increase up to about 16000 $\mu g/L$). Therefore, Cr (VI) impacts nitrate reduction, as seen earlier for the QAL columns. However, the level of nitrate reduction for the UMCf columns was less than that observed for QAL.

Figure 5.38 (b) shows the nitrate concentrations in UMCf columns with low amount of substrate (mixture of Industrial Sugar Wastewater and EOS-PRO). The effluent nitrate concentration was about 300 mg/L as NO $_3$ until Day 43. On Day 44, the concentrations increased for an unknown reason. On Day 45, nitrate decreased slightly (about 150 mg/L as NO $_3$), continuing to below 100 mg/L as NO $_3$ on Day 98. Therefore, for both chromium and nitrate biological reduction was poorer in the UMCf columns than in the QAL columns. Note that the Cr (VI) degradation was slow in UMCf columns. Only after Day 79 was the Cr (VI) below 1000 μ g/L in Column A and after Day 85 in Column B. The nitrate remained below 150 mg/L as NO $_3$ throughout the study period, except for Day 147 in UMCf Column B. As mentioned earlier, in the field UMCf contact times are greater than the ones simulated in the UMCf columns and reduction is expected to be more effective.

In the QAL columns, nitrate reduction to < 1 mg/L was observed when chromium concentrations were below detection; for the UMCf columns, the lowest nitrate obtained was 50 mg/L. Again, this difference is due to the shorter contact time (5.2 to 7.2 days) in the UMCf columns as compared to that in the QAL columns (8.9 to 10.6 days). In the field, UMCf contact times will be much greater than the ones that were feasible to simulate in the laboratory.



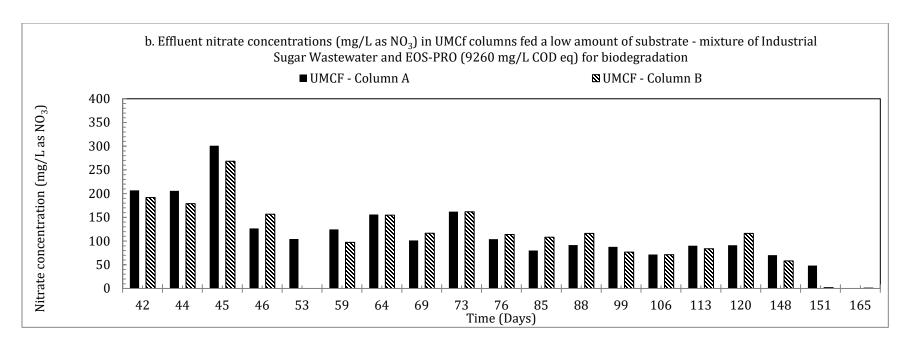


Figure 5.38: Effluent nitrate concentrations in the UMCf.

5.2.5 Chlorate Concentrations

Figure 5.39 shows the effluent concentrations of chlorate over the study period in QAL columns. Chlorate was not measured in all samples because it was not biodegrading initially. The lag in biodegradation is due to the negative impact of Cr (VI) and nitrate on chlorate and perchlorate degradation. Chlorate degradation was observed by Day 24, after Cr (VI) was below non-detect and nitrate levels were about 2 mg/L as NO₃ in both columns. Therefore, the QAL columns results show that chlorate will degrade after nitrate and Cr (VI) have been utilized. The impact of nitrate on chlorate degradation was observed on Day 64 when the nitrate was less than 2 mg/L as NO₃ in Column A and Column B had about 17 mg/L as NO₃. The effluent chlorate in Column A was half (about 250 mg/L) of the chlorate in Column B (about 500 mg/L). On Day 108, chlorate was observed at half of its influent concentration, thw significant increase is suspected to be related to the cracks formed during the power outage on Day 105. After Day 127, no chlorate was observed in the QAL columns—correlating to the period where both Cr (VI) and nitrate had also reduced.

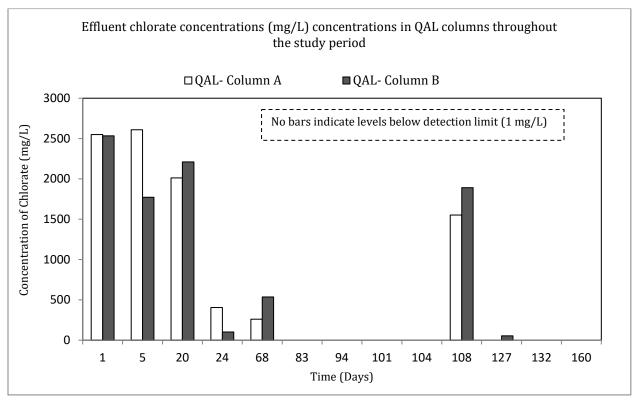


Figure 5.39: Effluent chlorate concentrations in the QAL.

Figure 5.40 shows the effluent concentrations of chlorate in UMCf columns A and B. On Day 113, chlorate was observed at half of its initial influent concentration (i.e 3000 mg/L). In UMCf column A, no chlorate was observed on Day 137 as on Day 151 in UMCf column B. For the UMCf columns, chlorate was biodegraded to non-detectable levels after Day 151 and after Cr (VI) and nitrate had been reduced.

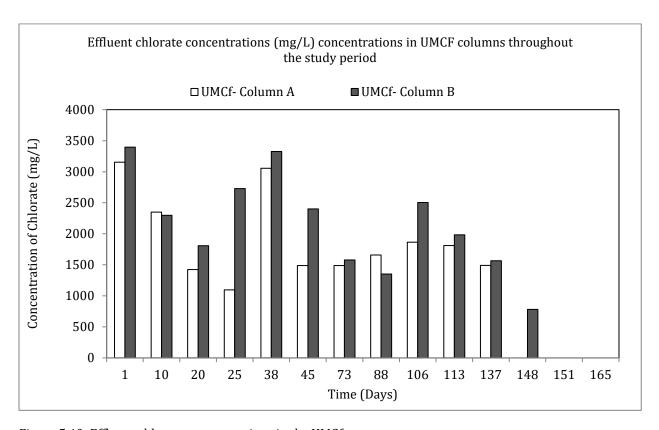


Figure 5.40: Effluent chlorate concentrations in the UMCf.

5.2.6 Perchlorate Reduction

Figure 5.41 shows the effluent perchlorate concentration in QAL columns. No perchlorate degradation was observed until Day 101 in QAL columns. The lower value of perchlorate on Day 17 (not shown on graph) relates to the lower influent perchlorate concentration (about 300 mg/L) fed to the column prior to this date. On Day 115, the perchlorate concentration was half the initial concentration in both columns. Recall that chlorate had degraded about 50% by Day 68 and was completely degraded on Day 127.

Therefore, the degradation of perchlorate—observed in Day 132 of QAL—follows chlorate degradation.

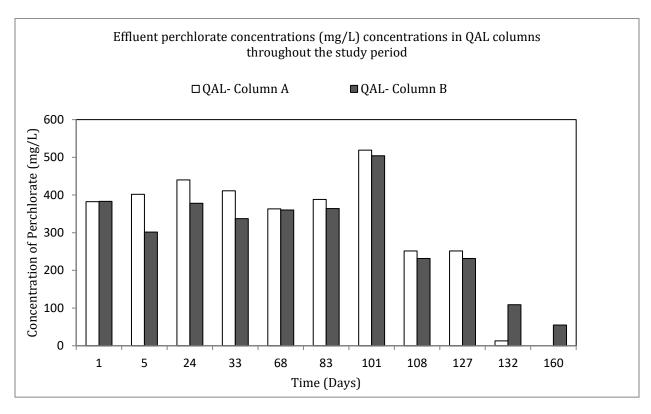


Figure 5.41: Effluent perchlorate concentrations in the QAL.

Figure 5.42 shows the effluent perchlorate concentration in UMCf columns. No perchlorate degradation was observed until Day 165 in UMCf columns. On Day 1, the influent perchlorate concentration was 337 mg/L, but the groundwater obtained on Day 20 and onwards had a perchlorate concentration above 500 mg/L. Therefore, the lower effluent perchlorate concentrations observed in the beginning of the run relates to the lower concentrations in the feed groundwater.

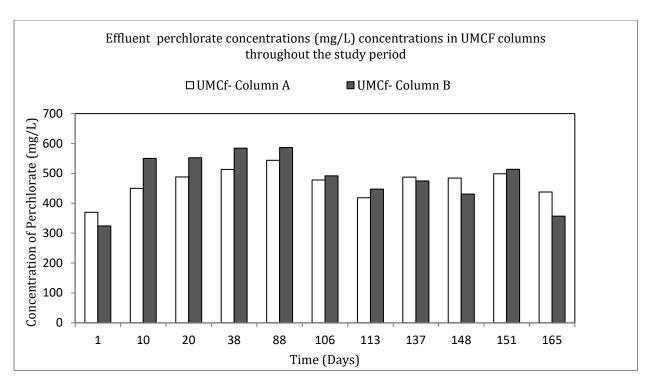


Figure 5.42: Effluent perchlorate concentrations in the UMCf.

5.2.7 Overall Degredation Timelines

The timeline and sequence of degradation for the contaminants of concern in the QAL and UMCf columns is illustrated in Figure 5.43. Notice that for QAL, chromium is reduced in about a week and nitrate degrades in about a month. However, three times more time is needed to degrade chlorate, and perchlorate degradation follows after chlorate degrades. For UMCf, it took longer to degrade each of the contaminants, especially nitrate which took 123 days to biodegrade.

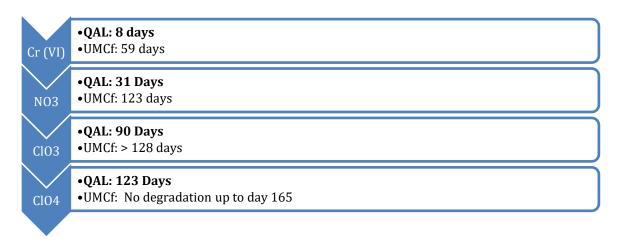
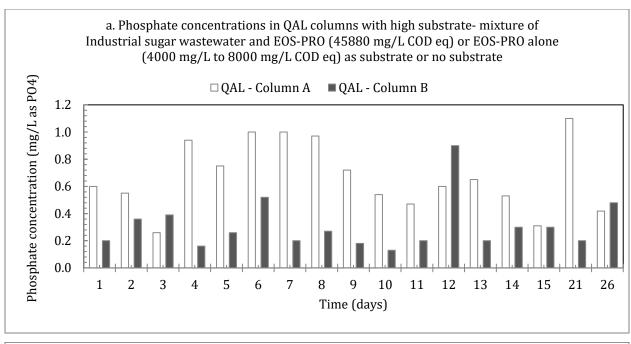


Figure 5.43: Timeline for degradation of contaminant in the columns

5.2.8 Phosphate Concentrations

Figures 5.44 (a) and (b) present the phosphate concentrations in QAL columns, and Figure 5.45 (a) and Figure 5.45 (b) depict the phosphate concentrations in UMCf Columns. No additional phosphate was added during the high substrate feeding period. Therefore, the readings were below 1.2 mg/L as PO₄ for all the QAL and UMCf columns. During the low strength substrate feeding, phosphate was added at about 120 mg/L as PO₄ along with the substrate. For the QAL columns, the effluent PO₄ concentrations were between 10-30 mg/L as PO₄ for most of the days during low strength substrate column feeding. In the UMC columns, the effluent PO₄ concentrations were even higher. These results indicate that the phosphate levels in the feed were too high and should be reduced in future testing or in the field pilot test.



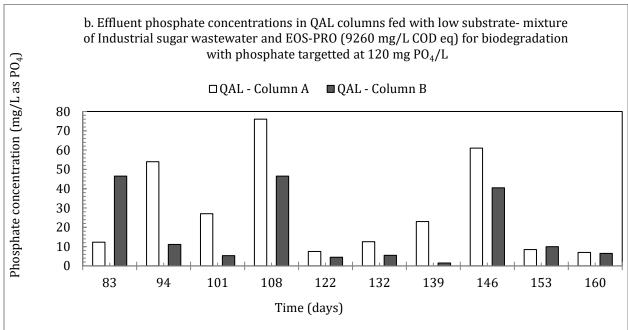
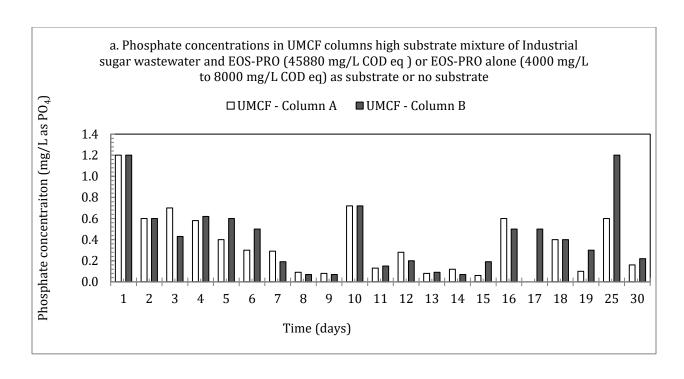


Figure 5.44: Effluent phosphate concentrations in the QAL.



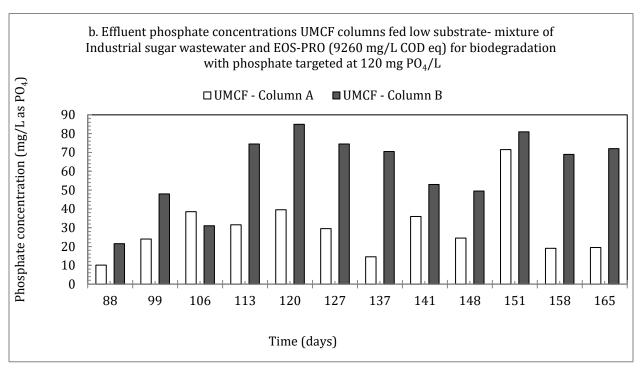


Figure 5.45: Effluent phosphate concentrations in the UMCf.

6. References

Carlson, C.A. and Ingraham, J.L., 1983. Comparison of denitrification by Pseudomonas stutzeri, Pseudomonas aeruginosa, and Paracoccus denitrificans. Applied and Environmental Microbiology, 45(4), pp.1247-1253.

Chen, Z.F., Zhao, Y.S., Zhang, J.W. and Bai, J., 2015. Mechanism and kinetics of hexavalent chromium chemical reduction with sugarcane molasses. Water, Air, & Soil Pollution, 226(11), p.363.

Crittenden, J.C., Trussell, R.R., Hand, D.W., Howe, K.J. and Tchobanoglous, G., 2012. MWH's water treatment: principles and design. John Wiley & Sons. Environ. Sci. Technol. 2005, 39, 6321-6327

Dogan, N.M., Kantar, C., Gulcan, S., Dodge, C.J., Yilmaz, B.C. and Mazmanci, M.A., 2011. Chromium (VI) bioremoval by Pseudomonas bacteria: role of microbial exudates for natural attenuation and biotreatment of Cr (VI) contamination. Environ Viti, C., Pace, A. and Giovannetti, L., 2003. Characterization of Cr (VI)-resistant bacteria isolated from chromium-contaminated soil by tannery activity. Current microbiology, 46(1), pp.0001-0005mental science & technology, 45(6), pp.2278-2285.

Formanek, J., Mackie, R. and Blaschek, H.P., 1997. Enhanced Butanol Production by Clostridium beijerinckii BA101 Grown in Semidefined P2 Medium Containing 6 Percent Maltodextrin or Glucose. Applied and Environmental Microbiology, 63(6), pp.2306-2310.

Freedman, D. L., Lehmicke, L., and Verce, M. F. (2005) Reductive dechlorination of tetrachloroethene following abiotic versus biotic reduction of hexavalent chromium. Bioremediation Journal 9(2), 87-97.

Graham, M. C., Farmer, J. G., Anderson, P., Paterson, E., Hillier, S., and Lumsdon, D. G. (2006) Calcium polysulfide remediation of hexavalent chromium contamination from chromite ore processing residue. Science of the Total Environment 364(1-3), 32-44.

Her, J. and Kim, J., 2013. Rummeliibacillus suwonensis sp. nov., isolated from soil collected in a mountain area of South Korea. Journal of Microbiology, 51(2), pp.268-272.

Inglett, K.S., Bae, H.S., Aldrich, H.C., Hatfield, K. and Ogram, A.V., 2011. Clostridium chromiireducens sp. nov., isolated from Cr (VI)-contaminated soil. International journal of systematic and evolutionary microbiology, 61(11), pp.2626-2631.

Lee, K., Choi, Y., Lee, B.S. and Nam, K., 2017. Differential mode of denitrification by Pseudomonas sp. KY1 using molasses as a carbon source. KSCE Journal of Civil Engineering, 21(6), pp.2097-2105.

Lindow, N.L., 2004. Use of soybean oil and soybean products for groundwater bioremediation.

Megharaj, M., Avudainayagam, S. and Naidu, R., 2003. Toxicity of hexavalent chromium and its reduction by bacteria isolated from soil contaminated with tannery waste. Current microbiology, 47(1), pp.0051-0054.

Messer, A., Storch, P., and Palmer, D. (2003) In situ remediation of a chromium-contaminated site using calcium polysulfide. Southwest Hydrology 7-8.

Muyibi, S.A. and Okuofu, C.A., 1995. Coagulation of low turbidity surface waters with Moringa oleifera seeds. *International Journal of Environmental Studies*, 48(3-4), pp.263-273.

Nguema, P.F. and Luo, Z., 2012. Aerobic chromium (VI) reduction by chromium-resistant bacteria isolated from activated sludge. Annals of microbiology, 62(1), pp.41-47.critteden

Pakzadeh, B., Batista, J.R., Chromium removal from ion-exchange waste brines with calcium polysulfide, water research 4 5 (2011)

Palmer, C. D., and Puls R. W. (1994). Natural attenuation of hexavalent chromium in groundwater and soils. EPA Ground Water Issue. EPA/540/5-94/505.

Qin, G., MC Guire, M. J., Blute, N. K., Fong, L., Hexavalent Chromium Removal by Reduction with Ferrous Sulfate, Coagulation, and Filtration: A Pilot-Scale Study.

Research and Testing, 2015, http://rtlgenomics.com/ (last accessed: 03/07/2017)

Somenahally, A.C., Mosher, J.J., Yuan, T., Podar, M., Phelps, T.J., Brown, S.D., Yang, Z.K., Hazen, T.C., Arkin, A.P., Palumbo, A.V. and Van Nostrand, J.D., 2013. Hexavalent chromium reduction under fermentative conditions with lactate stimulated native microbial communities. PloS one, 8(12), p.e83909.

Yu, G.H. and Tremaine, J.M. (2002) Pilot test using CASCADE® to treat Cr (VI) in groundwater of a carbonate aquifer, The Second International Conference on Oxidation and Reduction Technologies for In-Situ Treatment of Soil and Groundwater, Toronto, Ontario, Canada, November 17-21, 2002.

APPENDICES

Appendix A: Investigation of analytical interference with Cr (VI) in QAL groundwater

A.1 Issues with Measuring Low Cr (VI) Concentration QAL Groundwater

Problems measuring low chromium concentrations were first encountered in chemical batch testing (section 2.4). The groundwater spiked with high concentration of Cr (VI) measured 10,500 μ g Cr⁺⁶/L and 9800 μ g Cr⁺⁶/L for QAL and UMCf, respectively. The groundwater spiked with low concentration of Cr (VI) measured 520 μ g Cr⁺⁶/L in groundwater from UMCf. There were analytical interferences detected with measuring Cr (VI) in the spiked 'low concentration' QAL groundwater.

The Hach analytical method used to measure Cr (VI) had low accuracy when measuring QAL groundwater (25-30 ft bgs) spiked with 500 μ g Cr⁺⁶/L. The possible constituent interferences listed in the Hach method were Iron (> 1mg/L), mercurous/mercuric ions, highly buffered or extreme pH, turbidity, and vanadium (1 mg/L). The analytical results showed that the groundwater does not contain iron, pH, or turbidity exceeding the limits of interference. Mercurous/mercuric ions and vanadium were not analyzed. Therefore, a method sensitivity test was performed by spiking QAL and UMCf groundwater and a deionized water blank with chromium concentrations of 500, 1000, 2000, 3000, 4000, 5000, and 10000 μ g Cr⁺⁶/L. The Cr (VI) concentrations were measured immediately after mixing and a percentage error was calculated for each test. Table A.1 shows that the percentage error in QAL samples increased as the concentration of the chromium decreased.

Table A.1: Chromium Standarization Test Results using Groundwater from 25-30 ft spiked to 500, 1000, 2000, 3000, 4000, 5000, and 10000 μ g Cr⁺⁶/L

	QAL groundwat	ter U	MCf groundwat	er Bla	nk (DI water)	
Expected (µg Cr+6/L)	Measured (μg Cr+6)	Error (%)	Measured (μg Cr+6)	Error (%)	Measured (μg Cr+6)	Error (%)
10000	8600	14	NA		NA	
5000	4600	8	NA		NA	
4000	2500	37.5	4020	-0.5	4000	0
3000	2000	33.3	NA		NA	
2000	240	88	2080	-4	2040	-6
1000	120	88	1040	-4	1060	-6
500	70	86	520	-4	520	-4

In the QAL samples, Cr (VI) analysis of concentration $\geq 5000~\mu g/L$ had analytical error < 15%, which is the QA/QC threshold typically followed in our laboratory. Therefore, QAL measurement of concentrations $< 5,000~\mu g/L$ (0.5 mg/L) will incur significant error margins. To eliminate this issue, total chromium concentrations were measured using inductively coupled plasma (ICP) for the QAL samples. The results of the sensitivity tests performed in UMCf groundwater (35-40 ft bgs) and a spiked blank (with nanopure water) exhibited no analytical issue with Cr (VI).

The QAL groundwater was analyzed for COD and phosphate (Table A.2) to detect other potential interferences with the Hach method (not listed in the Hach document, but potential interferences for other methods). The COD of the QAL groundwater, 58 mg/L, is relatively high for groundwater and reflects the potential presence of organic compounds. After spiking with Cr (VI), duplicate analyses of QAL with the elevated COD showed an error of 14% in the chromium analysis. This difference is within the expected 15% error for the laboratory QA/QC. Palmer and Puls (1994) suggested that hexavalent chromium can be immobilized within soils in the presence of natural organic matter. The nature of the organic compounds present in the QAL groundwater was not known at the time of these analyses. It was suspected that organics may be interfering or immobilizing hexavalent chromium in the QAL groundwater.

Table A.2: Other Contaminants in Groundwater from 25-30 ft spiked with 2000 μg Cr⁺⁶/L

	Concentration in QAL groundwater	Concentration in QAL groundwater after spiking with 500 µg Cr+6/L	Error (%)
Ferrous Iron (mg/L)	0.07	0.06	14.28
COD (mg/L)	58	50	13.80
Phosphate (mg/L)	0.52	0.50	3.84
Chromium(µg/L)	40	70	42.85

To test the hypothesis that the Cr (VI) analysis is affected by the presence of organics in the QAL groundwater, the groundwater was first diluted (1, 5, 10, and 100 times) and then spiked with 500 μ g Cr⁺⁶/L. Further, the 10X diluted groundwater spiked with with 500 μ g Cr⁺⁶/L, was further diluted by 2 and 10 times (final dilutions of the groundwater were 20 and 100) such that the expected chromium concentrations were 250 μ g Cr⁺⁶/L and 50 μ g Cr⁺⁶/L, respectively. The expected and measured Cr (VI) concentrations in the diluted QAL groundwater, and the percent error are presented in Table A.3.

Table A.3: Chromium Test in Diluted Groundwater from 25-30 ft spiked with 500 μg Cr⁺⁶/L

GW Diluted	Expected value	Readings	Error
by Factor	μg/L Cr+6	μg/L Cr ⁺⁶	(%)
No dilution	500	70	86.0
5	500	70	86.0
10 [†]	500	140	97.2
10	500	160	68.0
20*	250	210	16.0
100	500	470	6.0
100	500	490	2.0
100*	500	520	4.0

^{*}The samples were diluted from the diluted GW at the dilution factor of 10^{\dagger} .

The data in Table A.3 show that the accuracy of chromium measurement in the QAL groundwater improved with increased dilution. Therefore, it was concluded that organic compounds were possibly interfering with Cr (VI) analysis. Independent analyses of QAL groundwater (Tetra Tech communication from 2016) for typical simple organics (i.e., short chain fatty acids) were performed and the results indicated that acetic acid, formic acid,

lactic acid, n-butyric acid, propionic acid, and pyruvic acids were not detected. Tetra-tech performed these field tests to detect organics in the groundwater.

Following, the QAL groundwater was pretreated with granular activated carbon (GAC, Calgon Carbon-F400), as an attempt to remove potential organic compound interfering the Cr (VI) analysis. Some GACs also remove chromium, but the groundwater was spiked with Cr (VI) after processing through the GAC (Satapaty et al., 2005). The QAL groundwater was filtered through 50 mL GAC at the rate of 25 mL/min or 1 mL/min. Further, the GAC-treated groundwater was diluted by 5, 10 and 100 times. Finally, the groundwater was spiked with 500 μ g Cr⁺⁶/L. Table A.4 shows the results for the GAC treated and diluted groundwater sample. COD remained similar to that of the groundwater.

Table A.4: Chromium Test in Diluted QAL Groundwater spiked with 500 μg Cr⁺⁶/L

QAL groundwater with initial COD 43.6 mg/L Flow rate of 25 mL/min Flow rate of 1 mL/min COD after GAC treatment: 48.6 mg/L COD after GAC treatment: 50 mg/L Expected Readings Expected Readings **GW** Diluted value μg/L **GW** Diluted value µg/L mg/L Error μg/L Error Cr+6 by Factor Cr+6 Cr+6 (%) by Factor Cr+6 (%)No dilution No dilution

The results show that the potential interfering compounds present in the groundwater are not removed by granular activated carbon. It is not know at this time what compound in the groundwater is interfering with the Cr (VI) analysis. However, dilution with deionized water (100X) eliminated the interference with chromium (VI) analysis. This dilution was then used for the Cr (VI) analysis for QAL. In addition, total chromium analyses were performed using ICP.

Appendix B: Preliminary Batch Testing

The experimental methodology used for the preliminary batch testing can be found in section 2.4. Calcium polysulfide was used in the batch tests to reduce Cr (VI) to Cr (III) and precipitate Cr (III) as Cr (OH)₃. Calcium polysulfide (CaSx) (Calmet ®) was obtained from Best Sulfur products (Fresno, CA). It contains lime sulfur (calcium sulfide) at 24-29% by weight. The pH of CaSx ranges between 11.5 to 11.7 and the relative density is 1.27.

The ferrous sulfate solution was obtained from the product provided by Brenntag (Las Vegas, NV) to Envirogen at the NERT site. It contains 6% Fe by weight and the relative density is 1.203.

B.1 Preliminary Batch Testing Matrix for Cr (VI) Removal from QAL and UMCf Groundwater

Preliminary batch tests were conducted to determine the coagulant dose range required to remove low and high levels of chromium from the groundwater. The test was conducted with groundwater spiked with $10000 \, \mu g \, Cr^{+6}/L$ and $500 \, \mu g \, Cr^{+6}/L$. For the preliminary tests, two (2X) and three times (3X) the stoichiometric requirement for CaSx, and ten (10X) and thirty times (30X) the stoichiometric requirement for ferrous sulfate were selected. Table B1 shows the matrix for the tests.

Table B.1: Matrix for the Preliminary Testing with High and Low Concentrations of Cr (VI)

		High concentra	ation of Cr (VI)	Low concent	ration of Cr (VI)
	•	mL of CaSx/ 1000 L groundwater	mL of FeSO4/ 1000 L groundwater	mL of CaSx/ 1000 L groundwater	mL of FeSO4/ 1000 L groundwater
Selected ratio times the stoichio. ratio	2X	336		34	
(1.5 moles CaSx/mole Cr+6)	3X	505		50	
Selected ratio times the stoichio. Ratio (3 moles of Fe/ mole of Cr ⁺⁶)	10X		4472		224
	30X		8945		671

Raw CaSx = undiluted, as it comes from manufacturer.

B.2 Preliminary Batch Test Result for High Concentration of Chromium

The preliminary result for the high chromium concentration indicated that for QAL groundwater, calcium polysulfide at 2X the stoichiometric requirement and ferrous sulfate at 10X the stoichiometric requirement produced better removal (Table B2). The post-treatment concentrations of chromium for the QAL groundwater were both 20 μg Cr+6/L (99.8% removal). However, results for the UMCf groundwater were poor and removal was only 8-11% with CaSx. For FeSO4, the removal in UMCf varied widely from 8-92%. It was suspected that the poor removal of Cr was associated with the very low turbidity of the UMCf groundwater (UMCf turbidity \sim 6NTU). Therefore, further batch testing was peformed with UMCf groundwater in which one gram of dry UMCf soil per liter of UMCf groundwater was added.

Table B.2: Preliminary Batch Precipitation Test Results Groundwater with High Chromium Concentration (10200 $\mu g/L$)

Selected ratio times	of 10200 μg/L Cr ⁺⁶ ratio tim			Selected ratio times	Groundwater with initial concentration 10200 μg/L Cr+6				
the stoichio. ratio (1.5	(QAL	U	MCf	the stoichio. Ratio (3	Ç	AL	J	JMCf
moles CaSx/mole Cr+6)	Final µg/L Cr ⁺⁶	% removal	Final %	% removal	moles of Fe/ mole of Cr+6)	Final % µg/L Cr ⁺⁶ removal		Final µg/L Cr ⁺⁶	% removal
2X	20	99.8	9400	7.84	10X	20	99.8	9400	7.84
3X	0	100	9000	11.7	30X	50	99.5	800	92.1

The results of the batch tests with addition of soil to the UMCf groundwater exhibited final Cr concentrations of 10 μ g Cr⁺⁶/L (99.9% removal) for 2X CaSx and 30 μ g Cr⁺⁶/L (99.7% removal) with 30X FeSO₄. It is well established that coagulation in low tubidty water, such as the groundwater from the UMCf, is not effective (Muyibi et al., 1995).

Table B.3: Batch Test for UMCf Groundwater with addition of 1g dry UMCf soil/L groundwater Groundwater with initial concentration 10200 μ g/L Cr $^{+6}$ with 1g dry UMCf soil/L Calcium Polysulfide Ferrous Sulfate

Selected ratio times the stoichio. ratio (1.5 moles CaSx/mole Cr+6)	Final μg/L Cr+6	% removal	Selected ratio times the Stoichio. Ratio (3 moles of Fe/ mole of Cr+6)	Final µg/L Cr+6	% removal
2X	10	99.9	10X	45	99.6
3X	30	99.7	30X	30	99.7

B.3 Preliminary Batch Coagulation Test Using Low Cr Concentration

Preliminary batch coagulation tests were conducted without adding chromium to the groundwater because it already contained relatively low concentrations of chromium. The results of the batch testing for the selected ratios of 2X and 3X of the stoichiometry for CaSx, and 10X and 30X of the stoichiometry for ferrous sulfate are shown in Table B.4. The final concentration of chromium after precipitation was below the method detection limit (10 μ g Cr⁺⁶/L) for the QAL groundwater using 3X calcium polysulfide. For the UMCf groundwater, the final concentration was 10 μ g Cr⁺⁶/L using 10X ferrous sulfate. Note that the initial concentrations for QAL and UMCf groundwater were 50 μ g Cr⁺⁶/L and 70 μ g Cr⁺⁶/L, respectively.

In summary, preliminary testing indicated that for high chromium concentration in the QAL, calcium polysulfide at three times (3X) and ferrous sulfate at ten times (10X) the stoichiometric requirement lowered the Cr (VI) concentration to desired levels. For low chromium batch tests, calcium polysulfide at three times (3X) and the ferrous sulfate at 30 times (30X) stoichiometric ratios performed best. CaSx batches had Cr (VI) below 10 μ g Cr⁺⁶/L, but in batches with ferrous sulfate the 10 μ g Cr⁺⁶/L goal could not be met.

For the UMCf groundwater with high or low concentrations of Cr (VI), neither the use of CaSx nor ferrous sulfate met the 10 μ g Cr⁺⁶/L goal. The UMCF groundwater was free of any suspended solids—the clays that constitute the UMCf act as a filter and result in very clear groundwater—while the QAL groundwater contained a significant amount of suspended solids (turbidity in QAL was 1471 NTU). It was suspected that the poor coagulation of UMCf groundwater as compared to QAL groundwater was related to lack of

suspended solids (turbidity in UMCf was 6 NTU). It is well known in water treatment, that the absence of suspended solids results in poor coagulation (Crittenden et al. 2012).

To evaluate this hypothesis, further testing was performed by adding a gram of dry UMCf soil per liter of UMCf groundwater. The results showed improved removal with addition of soil; achieving similar removals to QAL when using CaSx at 2X the stoichiometric requirement and ferrous sulfate at 10X the stoichiometric requirement. However, the test with ferrous sulfate and groundwater mixed with soil still did not meet the desired 10 μ g Cr⁺⁶/L permit requirement.

Table B.4: Preliminary Batch Precipitation Test Results using Groundwater at Low Chromium Concentration with CaSx and FeSO4

		CaSx				Fe	S04		
Selected ratio times the stoichio. ratio (1.5 moles	QAL groundwater a with initial concentration 50 μg/L Cr+6		UMCf groundwater with initial concentration 70 μg/L Cr+6		Selected ratio times the Stoichio. mass ratio (3moles Fe/ mole Cr+6)	QAL groundwater a with initial concentration 50 µg/L Cr+6		UMCf grou with in concentr: µg/L	nitial ation 70
CaSx/mole Cr+6)	Final	%	Final	%		Final μg	%	Final	%
	μg Cr+6/L	removal	μg Cr+6/L	removal		Cr+6/L	removal	μg Cr+6/L	removal
2X	20	60	20	71.4	10X	10	80	40	42.8
3X	0	100	30	57.1	30X	30	40	20	71.4

Appendix C: Final Test Matrix for CaSx and Ferrous Sulfate Coagulation

The matrices in this appendix are for the secondary chemical batch testing discussed in section 2.4.3 and section 4.1.

C.1 Matrices for Final Batch Testing with QAL and UMCf Groundwater

Table C.1: Matrix for QAL and UMCf for High and Low Concentrations of Cr (VI)

Calcium Polysulfide with QAL and UMCF Ferrous sulfate with QAL and UMCf Selected ratio Selected ratio times the times the mL of FeSO₄ / 1000 L mL of CaSx / 1000 L stoichiometric Stoichiometric groundwater ratio (1.5 moles groundwater ratio (3moles Fe/mole Cr+6) CaSx/mole Cr+6) High Low High Low Concentration Concentration Concentration Concentration 1.5 1.5

Table C.2: Matrix for QAL and UMCf with filtered groundwater and addition of soil

Sample type	Selected ratio times the stoichiometric ratio	Volume of CaSx Raw CaSx mL/ 1000 L groundwater	Volume of FeSO4 mL/ 1000 L groundwater
Filtered	5	842	2236
through coffee filter	5	842	2236
	10	1682	4472
1 g soil	5	842	2236
added to the filtered	5	842	2236
groundwater	10	1682	4472

C.2 Data for Final Batch Testing with QAL and UMCf Groundwater

Table C3: pH in Batch Tests with High Cr (VI) concentrations in QAL and UMCf Groundwater (Initial Concentration= $10500 \mu g Cr^{+6}/L$) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)

Selected ratio times the	Calcium	Polysulfide	Selected ratio times the	Ferrous Sulfate	
stoichiometric ratio (1.5 moles CaSx/mole Cr+6)	QAL	Stoichiometric ra (3moles Fe/ mole)		QAL	UMCf
1.5X	8.01	7.78	5X	6.3	5.9
1.5X	8.12	7.85	5X	6.15	6.1
2X	8.04	7.81	10X	5.98	6.84
2X	8.06	7.97	10X	6.28	6.25
3X	8.18	7.92	20X	5.99	5.42
3X	8.2	7.93	20X	6.01	5.5
4X	8.26	7.88	30X	5.16	5.18
5X	7.85	7.99	50X	8.08	8.1
5X	8.21	8.03	50X	7.45	8.09

Table C.4: pH in Batch Tests with High Cr (VI) in QAL and UMCf Groundwater to Evaluate the Effect of Solids addition on Chromium Removal

Groundwater treatment	Selected ratio times the stoichiometric ratio for	CaSx	Ferrous Sulfate
for Jar test	CaSx and Ferrous Sulfate	QAL	UMCf
filtered	5X	8.29	6.98
through	5X	8.3	6.28
coffee filter	10X	8.22	6.42
1 g soil added	5X	8.12	6.81
to the filtered	5X	8.1	5.98
groundwater	10X	8.06	6.62

Table C.5: pH in Batch Test with Low Cr (VI) Concentration in QAL Groundwater (Initial Concentration= 500 μ g Cr⁺⁶/L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)

Selected ratio times the	Calcium Polysulfide		Selected ratio times	Ferrous Sulfate	
stoichiometric ratio (1.5 moles CaSx/mole Cr+6)	QAL UMCf ratio (3 mol		the Stoichiometric ratio (3 moles Fe/ mole Cr+6)	QAL	UMCf
1.5X	7.60	7.52	5X	7.40	7.22
1.5X	7.62	7.48	5X	7.44	7.32
2X	7.60	7.37	10X	7.29	6.98
2X	7.56	7.48	10X	7.32	7.08
5X	7.59	7.41	50X	7.10	6.74
5X	7.57	7.47	50X	7.14	6.75

Table C.6: Turbidity (NTUs) in Samples with Low Cr (VI) concentrations in QAL Groundwater (Initial Concentration= $500 \mu g \, \text{Cr}^{+6}/\text{L}$) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)

Selected ratio times the	Calcium Polysulfide		Selected ratio times the	Ferrous Sulfate	
stoichiometric ratio (1.5 moles CaSx/mole Cr+6)	QAL	QAL UMCf stoichiom (3moles Fe		QAL	UMCf
1.5X	174	54	5X	201	28
1.5X	181	48	5X	216	31
2X	153	66	10X	178	87
2X	170	70	10X	217	79
5X	146	103	50X	284	139
5X	159	93	50X	200	169

Table C.7: Nitrate (mg NO $_3$ /L) in the Batch Tests with High Cr (VI) Concentrations in QAL and UMCf Groundwater (Initial Concentration= 10500 μ g Cr⁺⁶/L) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)

Calcium Polysulfide Ferrous Sulfate Selected ratio times Nitrate (mg NO₃/L) Nitrate (mg NO₃/L) Selected ratio times the the stoichiometric Stoichiometric ratio (3.2 ratio (1.5 moles **QAL UMCf** QAL **UMCf** moles Fe/ mole Cr+6) CaSx/moles Cr+6) 2X 1089.43 628.86 10X 1089.43 602.28 5X 1116.00 611.14 50X 1116.00 389.71

Table C.8: Perchlorate (mg/L) in the Samples for High Cr (VI) in QAL and UMCf Groundwater (Initial Concentration= $10500 \mu g Cr^{+6}/L$) Using Calcium Polysulfide (CaSx, 27%) and Ferrous Sulfate (6%)

Calcium P	olysulfide		Ferrous Sulfate			
Selected ratio times	Perchlorate (mg/L)		Selected ratio times the	Perchlorate (mg/L)		
the stoichiometric ratio (1.5 moles CaSx/moles Cr+6)	QAL	UMCf	Stoichiometric ratio (3.2 mg Fe/mg Cr+6)	QAL	UMCf	
2X	1266.12	1399.27	10X	1194.35	1342.04	
5X	1212.15	1384.61	50X	1153.11	1326.04	

Appendix D: Preliminary Testing of Chromium Removal Using Columns

A preliminary coagulation test was operated in two columns with soil from the QAL and UMCf horizons of well UFIW-02. Approximately 2.5 kg of sun-dried (at about 107°C) soil was packed into the 2.5 inch diameter columns to mimic water flowrates encountered at the site. The approximate bulk densities of the soils were 1700 kg/m³ for the QAL column and 1550 kg/m³ for the UMCf. The groundwater used for this preliminary test was from well BMW1 spiked with 1000 μ g Cr⁺⁶/L in the feed water. CaSx was the coagulant used.

The QAL column was gravity fed and the UMCf column was operated in downflow mode at 30 psi using a peristaltic pump and a pressure valve built at the UNLV Engineering Shop. Figure D.1 shows the schematic diagram of the columns and their dimensions. In this experiment, the total contact depth of aquifer material was 13.5 inches. The injection port was filled with glassbeads to facilitate chemical injection. Three inches of aquifer material and gravel (cover) were placed above the injection port to prevent calcium polysulfide from diffusing upward. The cover was not considered as contact soil depth for this study since CaSx was injected below the cover. Table D.1 also shows the hydraulic properties of the columns. The empty bed contact times for the QAL and UMCf columns were 12 and 25 hours, respectively. The flowrate in the UMCf column was 0.5 mL/min and the flowrate in the QAL column was 1.0 mL/min at the start of the run.

The calcium polysulfide was injected once a day into the soil in the UMCf column. For the QAL column, a combination of Intravenous (IV) dial valve and flow reducer was used to maintain calcium polysulfide injection at a rate of 170 to 200 μ L/min continuously.

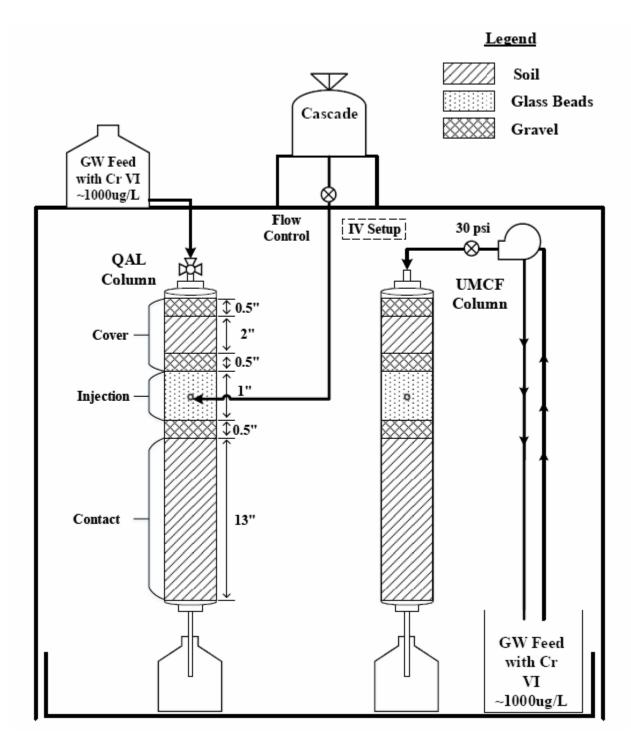


Figure D.1: Schematic diagram of the preliminary columns to remove chromium with CaSx

Table D.1: Hydraulic properties of the columns

QAL column (Gravity fed)			UMCf column (Pressurized at 30 psi)			
Flow (mL/min)	EBCT (hrs)	Hydraulic Conductivity (cm/s)	Flow (mL/min)	EBCT (hrs)	Hydraulic Conductivity (cm/s)	
1±0.5	12	8.56 E-04	0.5±0.09	25	8.60 E-06	

The preliminary columns were operated for 36 days. Figure D.2 and D.3 show the Cr (VI) effluent concentration measured with the Hach Method and the total dissolved chromium concentration measured by inductively coupled plasma (ICP) in acidified effluent samples. The effluent chromium concentration remained above 10 μg Cr⁺⁶/L (target effluent concentration) for the first three days in the UMCf column and the first four days in the QAL column (Figure D.2 indent). The concentrations of Cr (VI) after Day 4 in UMCf and Day 5 in QAL columns were below 10 μg Cr⁺⁶/L, except for a few instances. The dissolved total chromium results measured by ICP (Figure D.3) for those days with effluent Cr (VI) concentrations exceeding 10 µg Cr⁺⁶/L (except for UMCf sample on Day 7) were lower than the measured Cr (VI) concentrations using the Hach method. The ICP measurements are made in settled and filtered samples that have been acified while the Cr (VI) measurements are not. In addition, ICP is more accurate. Nonetheless, the results showed excellent chromium removals to levels below the permit requirements for NERT. The QAL column required 5 days and UMCf required 4 days after injecting calcium polysulfide to achieve an initial effluent Cr (VI) concentration below the target level of 10 μ g/L.

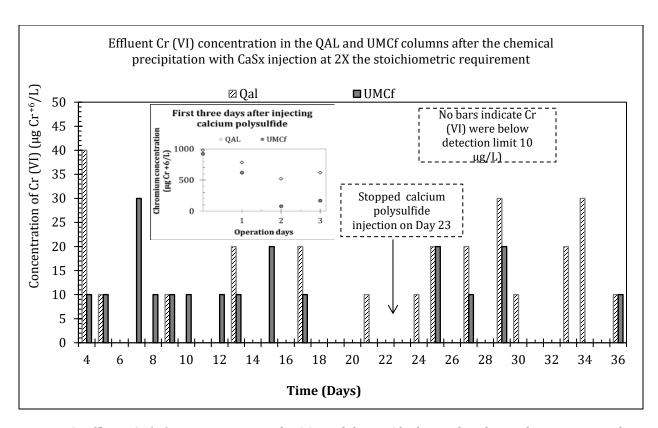


Figure D.2: Effluent Cr (VI) concentrations in the QAL and the UMCf column after chemical precipitation of chromium with calcium polysulfide. The indent in the picture shows chromium concentration in composite samples in days 1 to 3. (Calcium polysulfide was stopped on Day 23 represented by an arrow). The average influent hexavalent chromium concentration was 980 ± 0.01 mg/L and 960 ± 0.5 µg/L in QAL and UMCf, respectively. CaSx was fed continuously in QAL column, and was injected each day in UMCf column.

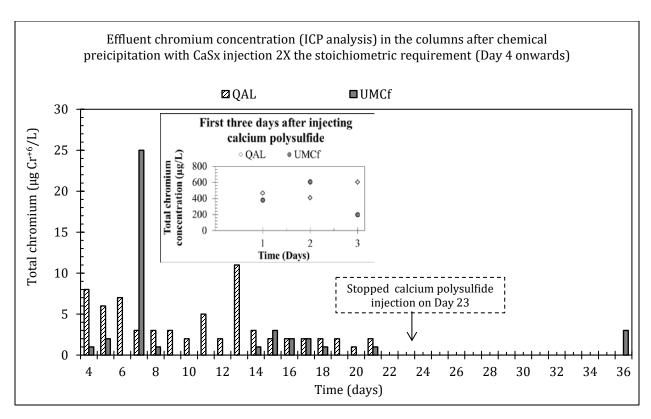


Figure D.3: Effluent dissolved chromium concentrations in the QAL and the UMCf column after chemical precipitation of chromium with calcium polysulfide from Day 4. The indent in the picture shows chromium concentration in composite samples in days 1 to 3. (Calcium polysulfide was stopped on Day 23 represented by the vertical arrow). Note that in columns, most of the precipitate was trapped by the soil media resulting in lower value of total chromium after sample filtration.

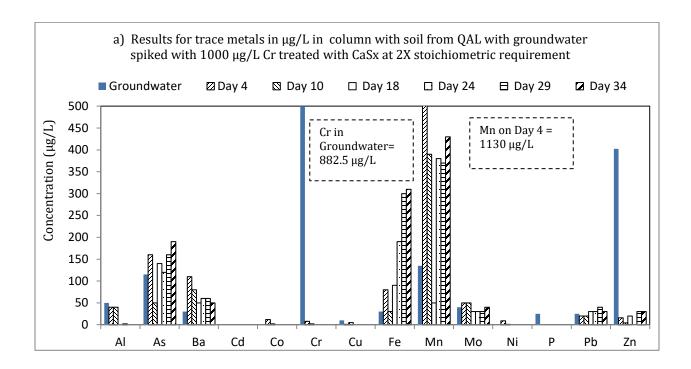
Table D.2 shows the statistical analysis of percent removal of hexavalent chromium in composite and grab samples for Days 3 to 23 in the columns (21 days). The minimum percent removal values were for Day 3 for the UMCf column and Day 4 for the QAL column.

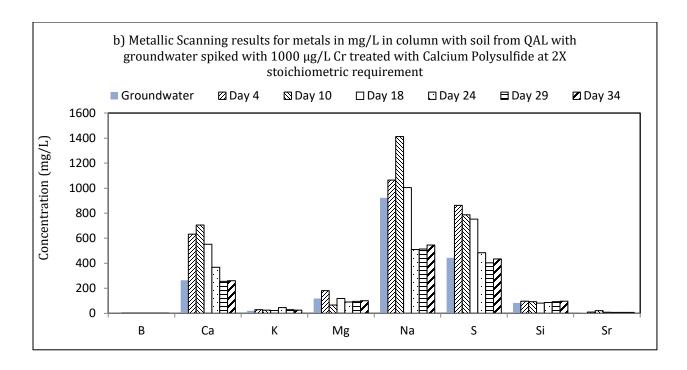
Table D.2: Statistical analysis of percent removal in the columns for composite and grab samples.

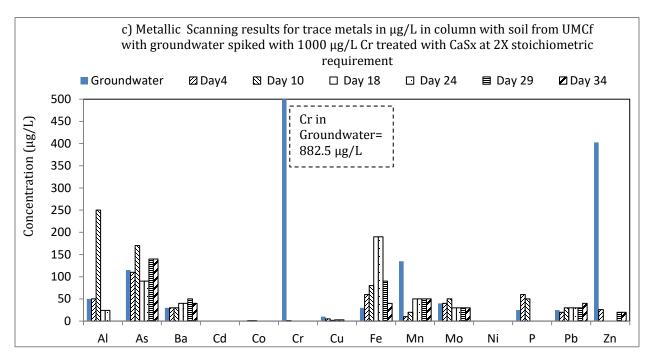
	Removal (%)						
	UMCf	column	QAL column				
	Composite sample Grab sample Composite			Grab sample			
Average	98 ± 3.5	99 ± 0.70	99 ± 0	99 ± 0.74			
Minimum	83	98	38	28			
Maximum	100	99	99	100			

Figure D.4 shows the metallic scanning of effluent over the operation period. Figure D.4 (a) and Figure D.4 (b) present metal concentrations for QAL column samples measured in μg/L and mg/L, respectively. Figure D.4 (c) and Figure D.4 (d) present metal concentrations for the UMCf column, again measured in μg/L and mg/L, respectively.

Arsenic, barium, iron and manganese concentrations in the effluent samples gradually increased with time compared to the groundwater concentrations in both columns. Calcium, Sodium and Sulfur increased initially, but their concentrations were comparable to the groundwater concentrations on Day 34.







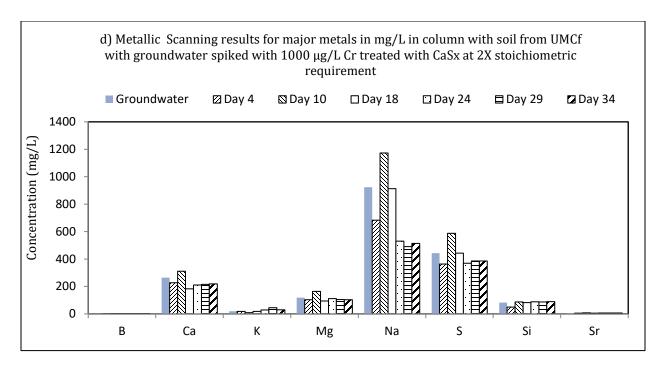


Figure D.4: Scanning of trace and major results in effluent in the QAL (a and b) and the UMCf (c and d) columns at different days.

Appendix E: Substrate Calculation

E.1: Calculation of Substrate Requirement

The substrate calculations in this appendix support the experiementation introduced in sections 2.6 and 2.7, then discussed further in chapter 5.

Table E.1: Amount of contaminants in groundwater

Contaminants amounts in the groundwater			Contaminant amounts in the groundwater for EOS-PRO calculation		
	mg/L	Molar ratios from the redox equation	mg in 100 mL groundwater	lb in 100 mL groundwater	
ClO4	300	1	30	6.60E-05	
NO ₃	600	0.75	45	9.98E-05	
Cr	5	2.463	1.2315	2.71E-06	
02	4	0.5	0.2	4.40E-07	
ClO3	3000	0.75	225	4.95E-04	
			Total	5.84E-04	

Table E.2: COD of the substrate

Substrate	Molasses	Industrial Sugar Wastewater	EOS-PRO	Sugar (100 g sugar/L)
COD (mg/L)	1,053,000	99,440	2,000,000	100,000

Table E.3: Substrate requirement calculation for Molasses, Industrial Sugar Wastewater, and Sugar

	Molasses	Industrial Sugar Wastewater	Sugar
Concentration of contaminants eq (ClO ₄ NO ₃ ClO ₃ and Cr (mg/L))	3014	2654	2654
Stoichiometric requirement for reducing contaminant (mol C/mol COD)	2.35	2.35	2.35
Required COD of electron donor (mg/L)	7083.64	7083.64	7083.64
X stoichiometric requirement	10	10	10
Total volume of groundwater to be treated (L)	1	1	1
Volume of electron donor REQUIRED (L) for 1 L GW	0.07	0.71	0.71

Table E.4: EOS-PRO requirement calculation

1 lb EOS PRO provides H2 for	0.25	lb contaminant	Source: EOS ®
Total volume of groundwater to be treated (L)	1		
contaminants in lb	0.0066		
lb EOS-PRO needed to remove the contaminant	0.0265		
EOS-PRO needed to remove the contaminant, Kg	0.012	kg EOS-PRO	
Density of EOS-PRO, Kg/L	0.98		
L of EOS-PRO needed for 1 L of GW	0.012		

E.2: Matrices Used for the Study

Table E.5: Matrix for preliminary microcosms (the amount added as mL per L GW is shown in parenthesis)

Substrate (mL/L GW)	1	2	3	4	5	6	7	8
F00 (60 I)	EOS 1	EOS 2	EOS 3	EOS 4	EOS 5	EOS 6	EOS 7	EOS 8
EOS (60 mL)	EOS 1 R	EOS 2 R	EOS 3 R	EOS 4 R	EOS 5 R	EOS 6 R	EOS 7 R	EOS 8 R
Mix (50 mL Industrial	MIX 1	MIX 2	MIX 3	MIX 4	MIX 5	MIX 6	MIX 7	MIX 8
Sugar Wastewater + 40 mL EOS-PRO)	MIX 1 R	MIX 2 R	MIX 3 R	MIX 4 R	MIX 5 R	MIX 6 R	MIX 7 R	MIX 8 R
Industrial Sugar	OS 1	OS 2	OS 3	OS 4	OS 5	OS 6	OS 7	OS 8
Wastewater (60 mL)	OS 1 R	OS 2 R	OS 3 R	OS 4 R	OS 5 R	OS 6 R	OS 7 R	OS 8 R
Molasses (40 mL) +	_	P + M 1		P + M 2		P + M 3		P + M 4
Phosphate		P + M 1 R		P + M 2 R		P + M 3 R		P + M 4 R
Dl l-	BLK 1							BLK 2
Blank	BLK 1 R							BLK 2 R
Molasses without	M w/o P 1							M w/o P 2
Phosphate	M w/o P 1 R							M w/o P 2 R
Industrial Sugar	0 w/o 1 P							0 w/o 2 P
Wastewater without phosphate	0 w/o P 1 R							0 w/o P 2 R

Table E.6: Matrix for microcosms with mixture of EOS-PRO and Industrial Sugar Wastewater (the amount added as mL per L GW is shown in parenthesis)

Substrate (mL/ L GW)	1	2	3	4	5	6
Mix-1 (12mL Industrial Sugar	MIX 1	MIX 2	MIX 3	MIX 4	MIX 5	MIX 6
Wastewater and 3 mL EOS-PRO)	MIX 1 R	MIX 2 R	MIX 3 R	MIX 4 R	MIX 6 R	MIX 5 R
Blank -						BLK 1
Dialik						BLK 2 R
Industrial Sugar Wastewater						0 w/o P 1
without phosphate (Control)						0 w/o P 1 R

Table E.7: Matrix for microcosms with mixture of EOS-PRO and Sugar (the amount added as mL per L GW is shown in parenthesis)

Substrate (mL/ L GW)	1	2	3	4
Mix-1 (12mL Sugar with COD	Sugar 1	Sugar 2	Sugar 3	Sugar 4
equivalent to Industrial Sugar Wastewater and 3 mL EOS-PRO)	Sugar 1 R	Sugar 2 R	Sugar 3 R	Sugar 4 R
Dlaula				BLK 1
Blank -				BLK 1 R
Sugar without phosphate				S w/o P 1
(Control)				S w/o P 1 R

E.3: Testing Impact of Chemical Reduction of Cr (VI) by Industrial Sugar Wastewater

This test was conducted to estimate the abiotic reduction contribution of Industrial Sugar Wastewater to hexavalent chromium removal. Chen et al. (2015) suggested that hexavalent chromium readily accepts electrons from the phenolic hydroxyl group and reduces to Cr^{+3} . The study showed that using molasses, Cr (VI) was reduced over wide range of pH (2-6).

To ensure no microbes were present for this test, Industrial Sugar Wastewater as well as groundwaters (QAL and UMCf) were filtered through 0.2 μ m filters separately. Eight bottles were filled with sterilized groundwater and Industrial Sugar Wastewater was added at 6% and 16% by volume. After adding Industrial Sugar Wastewater, hexavalent chromium was measured after 4 hours and 4 days.

Table E1 shows that Cr (VI) concentration was reduced by about 35% in both QAL and UMCf groundwater when 6% (by volume) Industrial Sugar Wastewater was added to the groundwater. On Day 4, the Cr (VI) concentration had reduced further—by 47% in QAL and 40% in UMCf groundwater. Upon increasing the Industrial Sugar Wastewater content to 16%, the Cr (VI) remained at 47% in QAL and increased to 42% in UMCf groundwater within 4 hours. After 4 days, the Cr (VI) concentration had been reduced by 59% in QAL and 52% in UMCf groundwater. Therefore, it is possible that the Cr (VI) reduction observed in the microcosms is the result of both abiotic and biotic reduction. However, the microcosms were not set up to fully answer this question. It is clear biological reduction occurs in the microcosms where EOS-PRO alone was used. In the Mix and Industrial Sugar Wastewater microcosms, there is the potential that some reduction was abiotic.

Table E.8: Impact of Industrial Sugar Wastewater on Cr (VI)

		Cr (VI) in the	Indu	n GW mixed with ustrial Sugar 'astewater	mixed wi	% removal in GW th Industrial Sugar Vastewater
		groundwater	4 hr	4 days	4 hr	4 days
6%	QAL	17	11	9	35.3	47.1
Industrial Sugar Wastewater	UMCf	21	13.5	12.5	35.7	40.5
16%	QAL	17	9	7	47.1	58.8
Industrial Sugar Wastewater	UMCf	21	12	10	42.9	52.4

Appendix F: Pictures of the Chemical Coagulation Tests for Cr Removal with CaSx and Ferrous Sulfate

F.1: Batch Coagulation Tests

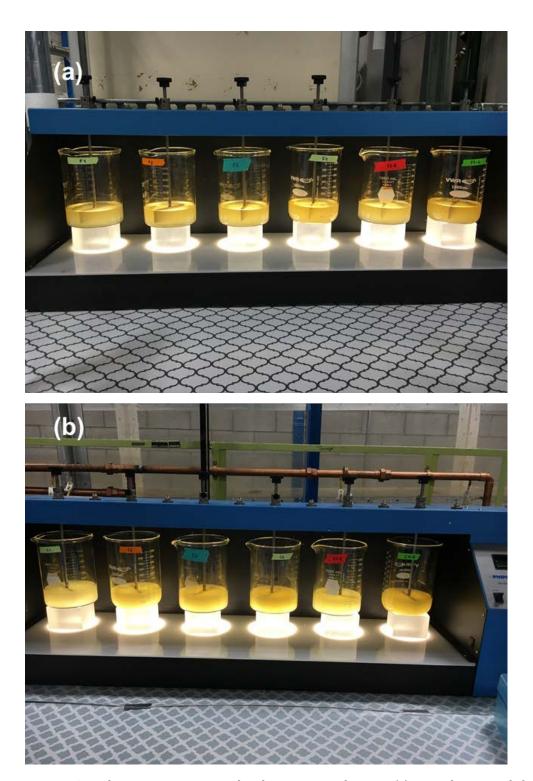


Figure F.1: High-range concentration batch experimental set-up: (a) groundwater with ferrous sulfate and (b) with calcium polysulfide.

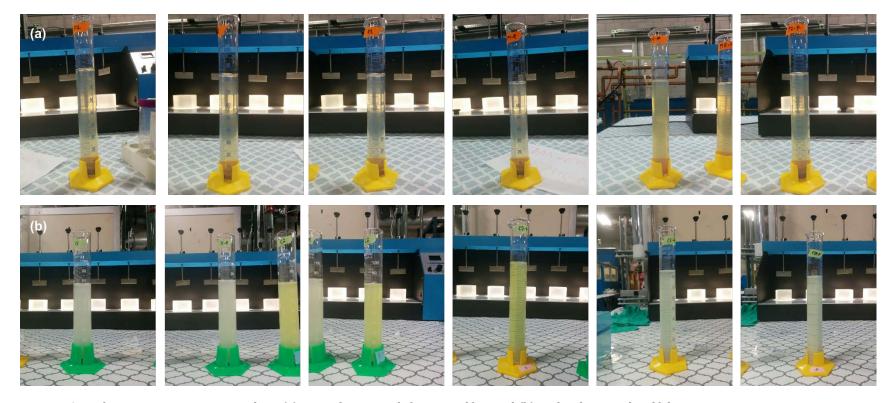


Figure F.2: High-range concentration settling: (a) groundwater with ferrous sulfate and (b) with calcium polysulfide.



Figure F.3: Low-range concentration batch experimental set-up for QAL groundwater (25 -30 feet bgs) (a) groundwater with ferrous sulfate and (b) with calcium polysulfide.

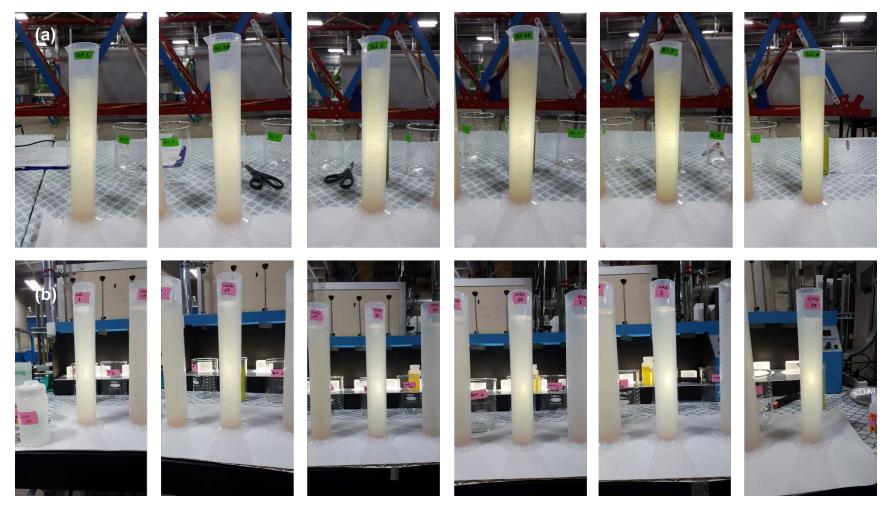


Figure F.4: Low-range concentration settling for QAL groundwater (25-30 feet bgs): (a) groundwater with ferrous sulfate and (b) with calcium polysulfide. Each set shows the sludge of individual tests.

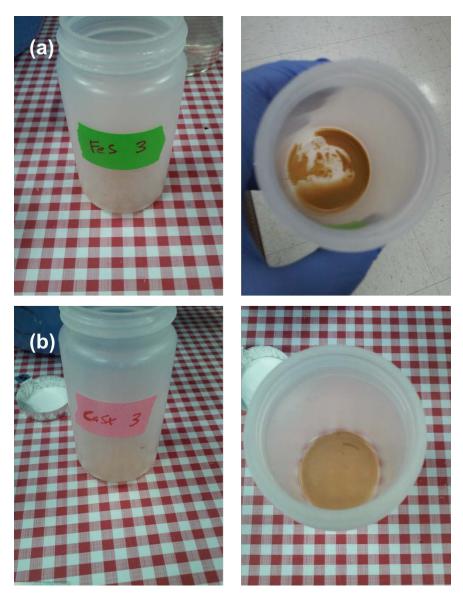


Figure F.5: Sludge content for low-range concentration for QAL groundwater 25 to 30 feet bgs) with 0.50 mg/L Cr (VI): (a) groundwater with ferrous sulfate and (b) with calcium polysulfide.

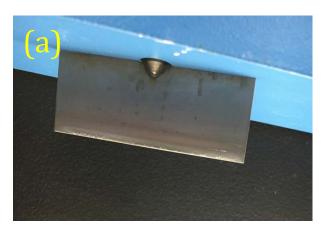




Figure F.6: Stirrers after operating batch precipitation test with groundwater from 25-30 ft containing high-range chromium concentration: (a) ferrous sulfate or (b) with calcium polysulfide showing that no inorganic scales were formed on the stirrer.

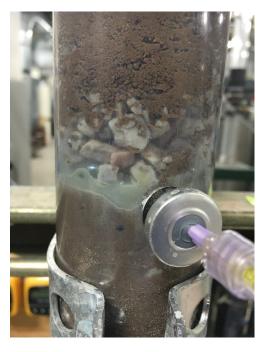
F.2 Column Coagulation Tests



Figure F.7: Injection port on UMCf column Day 1



Figure F.8: Injection port on UMCf column Day 16



 $Figure \ F.9: Injection \ port \ on \ QAL \ column \ Day \ 5 \ shows \ the \ white \ scale \ formation \ at \ the \ injection \ port$



Figure F.10: Injection port on QAL column Day 16 shows the white scale formation at the injection port

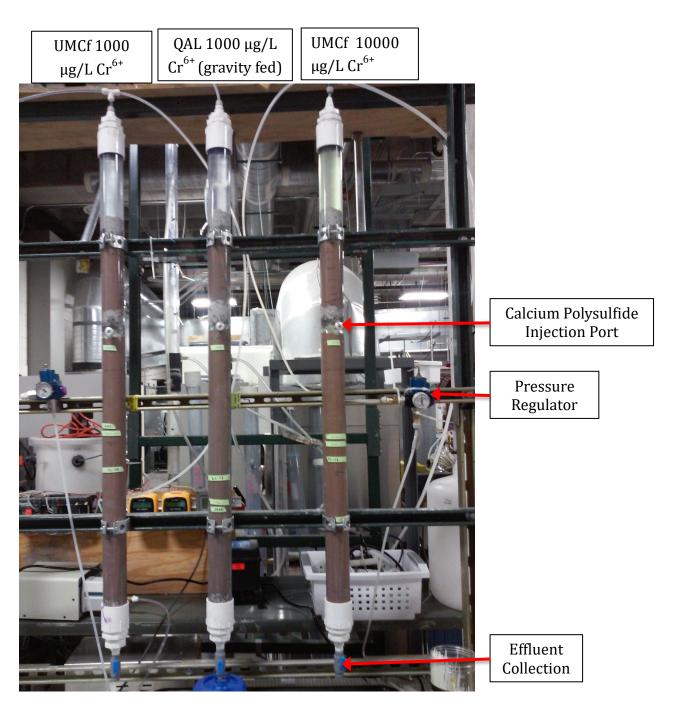


Figure F.11: Set-up of the Final columns for Cr Treatment with CaSX



Figure F.12: Injection port showing with gravel and glass beads.

Appendix G: Raw Data for Microbial Numbers and Diversity in the Microcosms

Table G1: Microbial Data of the Phase 1 Microcosms (Preliminary)

Classification	QAL		QAL		UMCf	
	MIX 4 (chromium reducer)	EOS- PRO 4	MIX 4	MIX 64	MIX 4	MIX 64
Archaea ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified			0.09			
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Corynebacteriaceae ; Corynebacterium ; Corynebacterium sp	0.49		1.01			0.01
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Corynebacteriaceae ; Turicella ; Turicella otitidis		0.12				
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Dietziaceae ; Dietzia ; Dietzia sp			0.01			
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Cellulomonadaceae ; Cellulomonas ; Cellulomonas hominis		0.06		0.01		
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Cellulomonadaceae ; Cellulomonas ; Cellulomonas sp		3.22	0.05	0.21	0.13	0.36
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Microbacteriaceae ; Frigoribacterium ; Frigoribacterium sp						0.04
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Micrococcaceae ; Arthrobacter ; Arthrobacter sp	0.98	0.19	3.23	0.78	0.17	0.11
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Sanguibacteraceae ; Sanguibacter ; Sanguibacter sp			0.02			
Bacteria ; Actinobacteria ; Actinobacteria ; Propionibacteriales ; Nocardioidaceae ; Nocardioides ; Nocardioides sp		0.12		0.83		0.08
Bacteria ; Actinobacteria ; Actinobacteria ; Streptomycetales ; Streptomycetaceae ; Streptomyces ; Streptomyces sp		0.04				

Bacteria ; Actinobacteria ; Actinobacteria ; Unclassified ; Unclassified ; Unclassified			0.01		
Bacteria ; Bacteroidetes ; Bacteroidia ; Bacteroidales ; Porphyromonadaceae ; Paludibacter ; Paludibacter sp	0.03				0.08
Bacteria ; Chloroflexi ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified		0.01			
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Bacillaceae ; Bacillus ; Bacillus sp		0.22	0.37		0.01
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Listeriaceae ; Listeria ; Listeria monocytogenes		0.16	0.18		
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Paenibacillaceae ; Brevibacillus ; Brevibacillus brevis					0.06
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Paenibacillaceae ; Paenibacillus ; Paenibacillus sp		0.37	0.01	0.17	0.17
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Planococcaceae ; Rummeliibacillus ; Rummeliibacillus suwonensis					1.02
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Planococcaceae ; Ureibacillus ; Ureibacillus thermosphaericus	0.31				
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Sporolactobacillaceae ; Sporolactobacillus ; Sporolactobacillus nakayamae					0.03
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Staphylococcaceae ; Staphylococcus ; Staphylococcus sp	0.02	0.09	0.19	0.04	
Bacteria ; Firmicutes ; Bacilli ; Bacillales ; Unclassified ; Exiguobacterium ; Exiguobacterium sp		0.25	0.02		
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Enterococcaceae ; Enterococcus ; Enterococcus faecalis		0.11	0.13		
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus amylolyticus		0.31	0.02		0.04
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus casei		0.42	0.11	0.03	0.03

Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus fermentum	0.46	0.45	0.02	0.24
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus harbinensis	0.54	0.02	0.06	0.05
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus kefiri	0.18	0.01	0.01	0.02
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus reuteri	0.28	0.05	0.03	0.05
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Lactobacillaceae ; Lactobacillus ; Lactobacillus sp	0.08	0.03		0.01
Bacteria ; Firmicutes ; Bacilli ; Lactobacillales ; Streptococcaceae ; Streptococcus ; Streptococcus sp			0.01	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ; Clostridium arbusti				0.36
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ; Clostridium beijerinckii		5.09		8.23
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ; Clostridium kluyveri		3.55		0.35
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ; Clostridium sp		6.37		4.83
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ; Clostridium tertium		0.16		
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Lactonifactor ; Lactonifactor longoviformis		0.02		
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Anaerosporobacter ; Anaerosporobacter mobilis		0.07		
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Lachnoclostridium ; Clostridium saccharolyticum		0.40		
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Lachnoclostridium ; Eubacterium contortum		0.04		

Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Lachnospira ; Lachnospira sp			0.21
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Tyzzerella ; Clostridium propionicum		2.89	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Unclassified ; Unclassified		0.51	0.03
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Oscillospiraceae ; Oscillibacter ; Oscillibacter sp		0.26	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ; Candidatus Soleaferrea ; Candidatus Soleaferrea massiliensis		0.02	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ; Hydrogenoanaerobacterium ; Hydrogenoanaerobacterium sp		0.10	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ; Ruminiclostridium ; Clostridium cellulosi			0.06
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ; Ruminiclostridium ; Clostridium sporosphaeroides			0.25
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ; Ruminococcus ; Ruminococcus sp	0.01		
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Unclassified ; Intestinimonas ; Intestinimonas butyriciproducens		0.07	0.07
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Unclassified ; Pseudoflavonifractor ; Pseudoflavonifractor sp		0.02	
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Unclassified ; Unclassified ; Unclassified	0.01	2.63	
Bacteria ; Firmicutes ; Clostridia ; Unclassified ; Unclassified ; Unclassified		1.24	2.62
Bacteria ; Firmicutes ; Tissierellia ; Unclassified ; Unclassified ; Sedimentibacter ; Sedimentibacter sp		6.09	
Bacteria ; Firmicutes ; Unclassified ; Unclassified ; Unclassified ; Unclassified	0.01	0.01	1.31

Bacteria ; Planctomycetes ; Planctomycetia ; Unclassified ; Unclassified ; Unclassified ; Unclassified		0.01		
Bacteria ; Proteobacteria ; Alphaproteobacteria ; Rhizobiales ; Phyllobacteriaceae ; Mesorhizobium ; Mesorhizobium sp			0.01	
Bacteria ; Proteobacteria ; Alphaproteobacteria ; Sphingomonadales ; Sphingomonadaceae ; Sphingomonas ; Sphingomonas sp	0.07			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Burkholderiaceae ; Ralstonia ; Ralstonia sp		0.02		
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ; Comamonas ; Comamonas sp	2.37		0.04	8.85
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ; Pelomonas ; Pelomonas sp	0.04			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ; Rhodoferax ; Rhodoferax sp	0.22			0.01
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Aeromonadales ; Aeromonadaceae ; Aeromonas ; Aeromonas sp	7.89	0.20		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Alteromonadales ; Shewanellaceae ; Shewanella ; Shewanella sp		1.87		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Chromatiales ; Chromatiaceae ; Nitrosococcus ; Nitrosococcus sp		0.03		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Chromatiales ; Ectothiorhodospiraceae ; Arhodomonas ; Arhodomonas sp		0.04		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Enterobacteriales ; Enterobacteriaceae ; Averyella ; Averyella dalhousiensis	0.07			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Enterobacteriales ; Enterobacteriaceae ; Cronobacter ; Cronobacter dublinensis		0.17	0.14	1.19

Bacteria ; Proteobacteria ; Gammaproteobacteria ; Enterobacteriales ; Enterobacteriaceae ; Salmonella ; Salmonella enterica			0.10	0.20		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Moraxellaceae ; Acinetobacter ; Acinetobacter psychrotolerans	5.46					
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Moraxellaceae ; Acinetobacter ; Acinetobacter sp	0.07	5.34	19.82	0.52	19.08	0.50
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Pseudomonadaceae ; Pseudomonas ; Pseudomonas abietaniphila	1.24					
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Pseudomonadaceae ; Pseudomonas ; Pseudomonas aeruginosa		0.13	0.10	0.11		
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Pseudomonadaceae ; Pseudomonas ; Pseudomonas salinarum	1.41					
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Pseudomonadaceae ; Pseudomonas ; Pseudomonas sp	89.97	79.63	69.69	64.93	80.21	67.71
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Unclassified ; Unclassified		0.08			0.03	
Bacteria ; Synergistetes ; Synergistia ; Synergistales ; Synergistaceae ; Acetomicrobium ; Acetomicrobium sp				0.10		
Bacteria ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified		0.04		0.99		0.94
No Hit; No Hit; No Hit; No Hit; No Hit; No Hit; No Hit	0.39		0.04			

Table G2: Microbial Data of the Phase 2 Microcosms (3-12)

Classification	UM	Cf	Q	AL	QAL soil	UMCf soil
	Day 1	Day 70	Day 1	Day 70		
Archaea ; Thaumarchaeota ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified		0.06			0.54	2.27
Archaea ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified ;					0.46	
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Corynebacteriaceae ; Corynebacterium ; Corynebacterium callunae	0.02	0.01	0.02	0.03		
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Corynebacteriaceae ; Corynebacterium ; Corynebacterium sp	28.85	1.88	28.69	25.95		
Bacteria ; Actinobacteria ; Actinobacteria ; Corynebacteriales ; Corynebacteriaceae ; Turicella ; Turicella otitidis		0.05				
Bacteria ; Actinobacteria ; Corynebacteriales ; Nocardiaceae ; Rhodococcus ; Rhodococcus sp					0.04	
Bacteria ; Actinobacteria ; Actinobacteria ; Frankiales ; Frankiaceae ; Frankia ; Frankia sp					0.05	
Bacteria ; Actinobacteria ; Actinobacteria ; Geodermatophilales ; Geodermatophilaceae ; Blastococcus ; Blastococcus sp					0.17	
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Cellulomonadaceae ; Cellulomonas ; Cellulomonas sp		0.14		0.04	0.02	
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Intrasporangiaceae ; Janibacter ; Janibacter sp				0.01	0.03	
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Microbacteriaceae ; Leucobacter ; Leucobacter sp					0.35	
Bacteria ; Actinobacteria ; Actinobacteria ; Micrococcales ; Micrococcaceae ; Arthrobacter ; Arthrobacter sp	0.26	0.03	0.05	0.10		

Bacteria ; Actinobacteria ; Micrococcales ; Micrococcaceae ; Kocuria ; Kocuria sp	0.06	
Bacteria; Actinobacteria; Propionibacteriales; Nocardioidaceae; 0.02 0.05 0.03 Nocardioides; Nocardioides sp	0.04	
Bacteria ; Actinobacteria ; Unclassified ; Unclassified ; Unclassified ; Unclassified ;	0.38	0.33
Bacteria ; Actinobacteria ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified	0.02	
Bacteria ; Bacteroidetes ; Bacteroidia ; Bacteroidales ; Prevotellaceae ; Prevotella ; Prevotella bivia	0.03	
Bacteria ; Bacteroidetes ; Cytophagia ; Cytophagales ; Cytophagaceae ; Cytophaga ; Cytophaga sp	0.06	
Bacteria ; Bacteroidetes ; Flavobacteriia ; Flavobacteriales ; Cryomorphaceae ; Fluviicola ; Fluviicola sp	0.03	
Bacteria ; Bacteroidetes ; Flavobacteriia ; Flavobacteriales ; Cryomorphaceae ; Owenweeksia ; Owenweeksia sp		0.05
Bacteria ; Bacteroidetes ; Flavobacteriia ; Flavobacteriales ; Cryomorphaceae ; Unclassified ; Unclassified	0.03	
Bacteria ; Bacteroidetes ; Flavobacteriia ; Unclassified ; Unclassified ; Unclassified ; Unclassified	0.13	
Bacteria ; Bacteroidetes ; Sphingobacteriia ; Sphingobacteriales ; Sphingobacteriaceae ; Sphingobacterium ; Sphingobacterium sp		0.39
Bacteria ; Chlamydiae ; Chlamydiaes ; Parachlamydiaceae ; Parachlamydia ; Parachlamydia acanthamoebae	0.08	
Bacteria ; Chlamydiae ; Chlamydiia ; Unclassified ; Unclassified ; Unclassified ; Unclassified ;	0.29	
Bacteria ; Chloroflexi ; Anaerolineae ; Anaerolineales ; Unclassified ; Unclassified ; Unclassified	0.04	
Bacteria ; Chloroflexi ; Dehalococcoidia ; Dehalococcoidales ; Dehalococcoidaceae ; Dehalococcoides ; Dehalococcoides sp	0.11	
Bacteria ; Chloroflexi ; Unclassified ; Unclassified ; Unclassified ; Unclassified ; Unclassified ;	0.06	
Bacteria ; Deinococcus-Thermus ; Deinococci ; Deinococcales ; Unclassified ; Unclassified ; Unclassified	0.11	
Bacteria ; Elusimicrobia ; Elusimicrobia ; Elusimicrobiales ; Elusimicrobiaceae ; Elusimicrobium ; Elusimicrobium sp	1.30	
Bacteria; Firmicutes; Bacilla; Bacillales; Bacillaceae; Bacillus; Bacillus sp 1.23 1.97 0.61 0.22		

	0.01	0.07	0.06	
	0.01	0.07	0.06	
	0.04			
	0.04			
0.07	42 24	0.72	31 20	
0.07	12.21	0.72	31.20	
27 00	14 34	5 46	2.97	
	1 1	0.10	,,	
0.26		0.14	0.04	
		0.02	0.07	
3.81	0.93	2.00	2.51	
0.06	0.11	0.07	0.10	
3.81	1.85	2.14	1.98	
				0.04
				0.07
5.38	6.94	1.53	2.02	
0.03	0.14	0.06	0.15	
			0.10	
0.33	0.11	0.07	0.10	
				0.06
				0.06
			0.04	
0.03			0.20	
24.39	15.14	48.92	25.44	
	5.40		0.86	
	0.06	27.00 14.34 0.26 3.81 0.93 0.06 0.11 3.81 1.85 5.38 6.94 0.03 0.14 0.33 0.11	0.04 0.07 42.24 0.72 27.00 14.34 5.46 0.26 0.14 0.02 3.81 0.93 2.00 0.06 0.11 0.07 3.81 1.85 2.14 5.38 6.94 1.53 0.03 0.14 0.06 0.33 0.11 0.07 0.03 24.39 15.14 48.92	0.07 42.24 0.72 31.20 27.00 14.34 5.46 2.97 0.26 0.14 0.04 0.02 0.07 3.81 0.93 2.00 2.51 0.06 0.11 0.07 0.10 3.81 1.85 2.14 1.98 5.38 6.94 1.53 2.02 0.03 0.14 0.06 0.15 0.33 0.11 0.07 0.10 0.03 0.20 0.20 24.39 15.14 48.92 25.44

Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ;	0.05	0.10	0.38	0.07		
Clostridium saccharobutylicum						
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Clostridiaceae ; Clostridium ;	2.76	5.07	8.48	4.46	0.01	0.46
Clostridium sp						
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Eubacteriaceae ; Eubacterium ;					0.02	
Eubacterium saphenum						
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Lachnospiraceae ; Lachnoclostridium			0.49	0.55		
; Clostridium fimetarium						
Bacteria; Firmicutes; Clostridia; Clostridiales; Lachnospiraceae; Lachnospira;	1.28	1.67		0.15		
Lachnospira sp						
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Ruminococcaceae ;		0.05	0.01	0.01		
Caproiciproducens; Caproiciproducens galactitolivorans						
Bacteria; Firmicutes; Clostridia; Clostridiales; Ruminococcaceae;		0.05				
Ruminiclostridium ; Clostridium cellulosi						
Bacteria; Firmicutes; Clostridia; Clostridiales; Ruminococcaceae;	0.27	0.28				
Ruminiclostridium; Clostridium sporosphaeroides						
Bacteria ; Firmicutes ; Clostridia ; Clostridiales ; Unclassified ; Unclassified ;		0.02				
Unclassified		0.02				
Bacteria; Firmicutes; Clostridia; Unclassified; Unclassified; Unclassified;	0.05	0.36	0.08	0.63		
Unclassified	0.00	0.00	0.00	0.00		
Bacteria ; Firmicutes ; Negativicutes ; Selenomonadales ; Veillonellaceae ; Veillonella ;						0.07
Veillonella sp						0.07
Bacteria; Firmicutes; Unclassified; Unclassified; Unclassified;		0.41		0.01		
Unclassified		0.11		0.01		
Bacteria ; Gemmatimonadetes ; Gemmatimonadetes ; Gemmatimonadales ;					0.06	
Gemmatimonadaceae ; Gemmatimonas ; Gemmatimonas sp					0.00	
Bacteria ; Nitrospinae ; Nitrospinai ; Nitrospinales ; Nitrospinaceae ; Nitrospina ;					0.71	
Nitrospina sp					0.71	
					0.20	
Bacteria ; Nitrospirae ; Nitrospira ; Nitrospirales ; Nitrospiraceae ; Nitrospira ;					0.20	
Nitrospira sp					0.42	
Bacteria; Planctomycetes; Planctomycetales; Planctomycetaceae;					0.12	
Planctomyces; Planctomyces sp						0.40
Bacteria; Planctomycetes; Planctomycetia; Planctomycetales; Unclassified;						0.12
Unclassified ; Unclassified						
Bacteria ; Proteobacteria ; Alphaproteobacteria ; Caulobacterales ; Caulobacteraceae ;	0.01	0.08			2.27	4.25
Phenylobacterium ; Phenylobacterium falsum						

Bacteria; Proteobacteria; Alphaproteobacteria; Caulobacterales; Caulobacteraceae;	0.44	19.27
Phenylobacterium; Phenylobacterium sp	0.10	0.76
Bacteria ; Proteobacteria ; Alphaproteobacteria ; Parvularculales ; Parvularculaceae ;	0.10	0.76
Parvularcula ; Parvularcula sp Bacteria ; Proteobacteria ; Alphaproteobacteria ; Rhizobiales ; Bradyrhizobiaceae ;	0.14	
Nitrobacter; Nitrobacter sp	0.14	
Bacteria ; Proteobacteria ; Alphaproteobacteria ; Rhizobiales ; Hyphomicrobiaceae ;		0.09
		0.09
Devosia ; Devosia sp Bacteria ; Proteobacteria ; Alphaproteobacteria ; Rhizobiales ; Phyllobacteriaceae ;	0.02	0.35
	0.02	0.35
Aliihoeflea ; Aliihoeflea sp	0.04	1 10
Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Phyllobacteriaceae;	0.04	1.10
Mesorhizobium; Mesorhizobium sp		0.04
Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Rhizobiaceae;		0.04
Rhizobium; Rhizobium sp		0.60
Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Rhizobiaceae;		0.69
Rhizobium; Rhizobium yanglingense	0.00	
Bacteria; Proteobacteria; Alphaproteobacteria; Rhizobiales; Rhodobiaceae;	0.02	0.07
Parvibaculum ; Parvibaculum sp	2.22	
Bacteria; Proteobacteria; Alphaproteobacteria; Rhodobacterales;	0.08	
Rhodobacteraceae ; Paracoccus ; Paracoccus sp		
Bacteria; Proteobacteria; Alphaproteobacteria; Rhodobacterales;	0.07	
Rhodobacteraceae; Rubellimicrobium; Rubellimicrobium sp		
Bacteria; Proteobacteria; Alphaproteobacteria; Rhodobacterales; Unclassified;	0.17	
Unclassified ; Unclassified		
Bacteria; Proteobacteria; Alphaproteobacteria; Rhodospirillales; Acetobacteraceae;	0.05	
Paracraurococcus ; Paracraurococcus sp		
Bacteria; Proteobacteria; Alphaproteobacteria; Rhodospirillales; Unclassified;	0.08	
Unclassified ; Unclassified		
Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales;	0.34	
Erythrobacteraceae ; Altererythrobacter ; Altererythrobacter oceanensis		
Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales;	0.05	
Erythrobacteraceae ; Erythrobacter ; Erythrobacter sp		
Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales;	0.02	2.66
Sphingomonadaceae; Novosphingobium; Novosphingobium sp		
Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales;	0.49	
Sphingomonadaceae; Sphingomonas sp		

Bacteria; Proteobacteria; Alphaproteobacteria; Sphingomonadales;		0.75	4.73
Sphingomonadaceae; Sphingopyxis; Sphingopyxis sp			
Bacteria; Proteobacteria; Betaproteobacteria; Burkholderiales; Burkholderiaceae;			0.05
Burkholderia ; Burkholderia sp			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Burkholderiaceae ;		0.20	7.17
Limnobacter ; Limnobacter sp			
Bacteria; Proteobacteria; Betaproteobacteria; Burkholderiales; Comamonadaceae;		0.01	0.08
Hydrogenophaga ; Hydrogenophaga sp			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ;	0.02	0.05	0.05
Pelomonas ; Pelomonas sp			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ;		0.07	0.29
Ramlibacter; Ramlibacter sp			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Comamonadaceae ;			0.56
Simplicispira ; Simplicispira sp			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Burkholderiales ; Oxalobacteraceae ;		0.06	0.37
Herbaspirillum ; Herbaspirillum rhizosphaerae			
Bacteria; Proteobacteria; Betaproteobacteria; Burkholderiales; Unclassified;		0.04	
Unclassified; Unclassified			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Nitrosomonadales ;		0.77	
Nitrosomonadaceae ; Nitrosomonas ; Nitrosomonas nitrosa			
Bacteria ; Proteobacteria ; Betaproteobacteria ; Rhodocyclales ; Rhodocyclaceae ;		0.02	0.20
Methyloversatilis; Methyloversatilis sp			
Bacteria; Proteobacteria; Deltaproteobacteria; Desulfuromonadales;		0.12	
Geobacteraceae ; Geoalkalibacter ; Geoalkalibacter sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Acidiferrobacterales;		0.02	
Acidiferrobacteraceae ; Sulfuricaulis ; Sulfuricaulis limicola			
Bacteria; Proteobacteria; Gammaproteobacteria; Alteromonadales;		0.02	
Alteromonadaceae ; Alishewanella ; Alishewanella sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Alteromonadales;		0.11	
Alteromonadaceae ; Marinobacter ; Marinobacter sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Alteromonadales; Colwelliaceae;		0.03	
Colwellia ; Colwellia sp			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Chromatiales ; Chromatiaceae ;		0.01	0.16
Rheinheimera ; Rheinheimera sp			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Chromatiales ;			0.03
Ectothiorhodospiraceae ; Unclassified ; Unclassified			

Bacteria ; Proteobacteria ; Gammaproteobacteria ; Chromatiales ; Thioalkalispiraceae ; Thiohalophilus ; Thiohalophilus thiocyanatoxydans		0.02	
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Legionellales ; Coxiellaceae ;		0.18	
Coxiella ; Coxiella endosymbiont			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Legionellales ; Legionellaceae ;		0.02	
Legionella ; Legionella pneumophila			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Legionellales ; Legionellaceae ;		0.20	0.69
Legionella ; Legionella sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Nevskiales; Sinobacteraceae;			0.89
Solimonas ; Solimonas sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Nevskiales; Sinobacteraceae;			0.05
Steroidobacter; Steroidobacter sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Oceanospirillales;		0.66	2.24
Alcanivoracaceae ; Alcanivorax ; Alcanivorax indicus			
Bacteria; Proteobacteria; Gammaproteobacteria; Oceanospirillales;		0.04	
Alcanivoracaceae ; Alcanivorax ; Alcanivorax sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Oceanospirillales; Unclassified;		0.02	0.11
Unclassified ; Unclassified			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ; Moraxellaceae		0.02	6.64
; Acinetobacter ; Acinetobacter sp			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Pseudomonadales ;	0.27	82.85	23.57
Pseudomonadaceae ; Pseudomonas ; Pseudomonas sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Pseudomonadales;		0.05	0.10
Pseudomonadaceae ; Pseudomonas ; Pseudomonas xinjiangensis			
Bacteria; Proteobacteria; Gammaproteobacteria; Unclassified; Unclassified;			0.39
Unclassified ; Unclassified			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Xanthomonadales ;		0.11	
Rhodanobacteraceae ; Rhodanobacter ; Rhodanobacter sp			
Bacteria; Proteobacteria; Gammaproteobacteria; Xanthomonadales; Unclassified;		0.09	0.04
Unclassified ; Unclassified			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Xanthomonadales ;		0.05	0.53
Xanthomonadaceae ; Lysobacter ; Lysobacter panaciterrae			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Xanthomonadales ;		0.20	
Xanthomonadaceae ; Lysobacter ; Lysobacter sp			
Bacteria ; Proteobacteria ; Gammaproteobacteria ; Xanthomonadales ;		0.27	
Xanthomonadaceae; Pseudoxanthomonas; Pseudoxanthomonas sp			
· · · · · · · · · · · · · · · · · · ·			

Bacteria; Proteobacteria; Gammaproteobacteria; Xanthomonadales;				0.09	
Xanthomonadaceae ; Xanthomonas ; Xanthomonas sp					
Bacteria; Proteobacteria; Unclassified; Unclassified; Unclassified;				0.04	0.30
Unclassified					
Bacteria; Unclassified; Unclassified; Unclassified; Unclassified;	0.02	0.19	0.03	2.28	16.45
Unclassified					
Bacteria; Verrucomicrobia; Opitutae; Opitutales; Opitutaceae; Alterococcus;				0.02	
Alterococcus agarolyticus					
No Hit; No Hit; No Hit; No Hit; No Hit; No Hit; No Hit				0.53	1.35

Appendix B Boring Logs and Well Construction Details

Biological Reduction Study

Table B-1 - Well Construction Details

Central Retention Basin

Well ID	Northing (feet)	Easting (feet)	Latitude	Longitude	Borehole Size (inches)	Well Diameter (inches)	Well Material (blank casing)	Well Vault	Filter Pack Material	Screen Material	Screen Interval (feet bgs)	Screen Top (feet bgs)	Screen Bottom (feet bgs)	Screen Length (feet)		Total Depth of Well (feet bgs)	TOC Elevation (feet amsl)	Ground Surface Elevation (feet amsl)
CTIW-01S	26719202.713	828135.837	36° 02' 48.27" N	115° 00' 05.74" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.010"	18.5 - 23.5	18.5	23.5	5	26.5	23.5	1,757.41	1,757.20
CTIW-01D	26719205.172	828140.000	36° 02' 48.29" N	115° 00' 05.69" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.010"	33 - 38	33	38	5	61.5	38	1,757.34	1,757.08
CTIW-02S	26719213.064	828154.451	36° 02' 48.37" N	115° 00' 05.51" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	26.5	24	1,757.45	1,757.39
CTIW-02D	26719215.001	828157.687	36° 02' 48.39" N	115° 00' 05.47" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 49	34	49	15	51.5	49	1,757.31	1,757.37
CTIW-03S	26719223.844	828169.245	36° 02' 48.48" N	115° 00' 05.33" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	26.5	24	1,757.32	1,757.31
CTIW-03D	26719225.419	828172.351	36° 02' 48.49" N	115° 00' 05.29" W	8	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 49	34	49	15	51.5	49	1,757.48	1,757.38
CTMW-01S	26719216.935	828141.284	36° 02' 48.41" N	115° 00' 05.67" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	61.5	24	1,757.16	1,757.18
CTMW-01D	26719217.228	828141.249	36° 02' 48.41" N	115° 00' 05.67" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 49	34	49	15	01.5	49	1,757.14	1,757.18
CTMW-02S	26719235.068	828163.802	36° 02' 48.59" N	115° 00' 05.40" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	61.5	24	1,757.21	1,757.32
CTMW-02D	26719234.810	828163.939	36° 02' 48.59" N	115° 00' 05.39" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 49	34	49	15	01.5	49	1,757.26	1,757.32
CTMW-03S	26719237.005	828129.568	36° 02' 48.61" N	115° 00' 05.81" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.010"	19 - 24	19	24	5	61.5	24	1,757.21	1,757.15
CTMW-03D	26719237.269	828129.763	36° 02' 48.61" N	115° 00' 05.81" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.010"	34 - 39	34	39	5	01.5	39	1,757.23	1,757.15
CTMW-04S	26719246.990	828147.930	36° 02' 48.71" N	115° 00' 05.59" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	61.5	24	1,757.00	1,757.17
CTMW-04D	26719246.759	828147.969	36° 02' 48.71" N	115° 00' 05.59" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 49	34	49	15	01.5	29	1,757.00	1,757.17
CTMW-05S	26719266.508	828149.570	36° 02' 49.20" N	115° 00' 05.99" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	61.5	24	1,757.24	1,757.15
CTMW-05D	26719266.615	828149.351	36° 02' 49.20" N	115° 00' 05.99" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 54	34	54	20	01.5	54	1,757.25	1,757.15
CTMW-06S	26719256.295	828177.643	36° 02' 49.23" N	115° 00' 05.74" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	19 - 24	19	24	5	64.5	24	1,757.43	1,757.17
CTMW-06D	26719256.058	828177.537	36° 02' 49.23" N	115° 00' 05.74" W	12	2	Sch. 40 PVC	18-in. Diameter Round	#2/16 Sand	2-in PVC 0.020"	34 - 54	34	54	20	- 61.5	54	1,757.42	1,757.17

Notes:

TOC

amsl Above mean sea level
bgs Below ground surface
btoc Below top of casing
GW Groundwater
in Inches
PVC Polyvinyl Chloride
Sch. Schedule

Top of Casing



BORING NUMBER CTIW-01D

PAGE 1 OF 3



	CLIEN	IT Neva	da Environ	mental Resp	onse Ti	rust (NERT)	PROJECT NAME NERT - In-Situ	u Chromium	Treatability Study
	PROJ	ECT NUM	IBER 194	-87600014- i	M12		PROJECT LOCATION Henderson	on, NV	
GP.	DATE	STARTE	D <u>11/28/1</u>	6	COMP	PLETED11/29/16	GROUND ELEVATION 1757.34	ft HOL	E SIZE <u>8 in</u>
OGS	DRILL	ING CO	NTRACTO	R National	EWP, Ir	nc.	WATER LEVEL AT TIME OF DRII	LLING 22.00	ft / Elev 1735.34 ft
Ľ	DRILL	ING ME	THOD Ho	llow Stem A	uger		WATER LEVEL AFTER DRILLING	3 <u>22.21 ft /</u> E	lev 1735.13 ft
ABIL	LOGG	ED BY _	Jeff Riches	on	CHEC	KED BY M. Crews			
REAT	NOTE	S Well o	completed	with an 18" t	raffic-ra	ted well box.			
SR-I		111		, J					
AL A	μ	SAMPLE TYPE NUMBER	√ TS JE)	ENVIRONMENTAL DATA	을				
S/GIN	DEPTH (ft)	JLE IMBI	BLOW COUNTS (N VALUE)	ONIV ATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM
LOG	D	AMF	m O Z	/IRC	g - 				
NING NING	0	Ŋ		Σ̈́					asing Type: Schedule 40 PVC
PROGRAM/BORING LO	_ 	∰ GB		Cr VI = 0.19 Cl04- =		brown (10YR 4/4), fin graded), dense, dry,	Gravel, (15,50,35,0), dark yellowis e to medium grained sand (poorly angular gravel (<30mm), sample		
CR TREATABILITY TEST/FIELD PROG	 5			1500		collected with hand a	uger. (Alluvium)		
S/87600014-NERT-M12/WORKING/IN-SITU CR TR		GB		Cr VI < = 0.16 Cl04- = 43			65,30,0), brown (7.5YR 5/3), fine to d (poorly graded), dense, moist, m). (Alluvium)		
18FS1\CES\PROJECTS\8760	10	GB	6-13-17 (30)	Cr VI < = 0.17 Cl04- = 17		medium grained sand angular to subangula	,65,25,0) brown (7.5YR 5/4), fine to di (poorly graded), dense, moist, r gravel (<5mm). (Alluvium)		2" Schedule 40 PVC Well Casing
7 12:47 - NTTS3	 15					4/4), fine to coarse gr	Gravel, (15,55,30,0), brown (7.5Y ained sand (well graded), dense, angular gravel (<35mm). (Alluvium	K	
BH - GINT STD US.GDT - 11/10/17		МС	21-22-25 (47)	Cr VI < = 0.16 Cl04- = 350		4/4), medium to coars	Gravel, (15,55,30,0), brown (7.5Y se grained sand (poorly graded), r to subangular gravel (<15mm).	R	Neat Cement Grout
ENVIRONMENTAL	20	∠ MC	50/4"	Cr VI < = 0.18		to medium grained sa cementation, very de gravel (<5mm). (Alluv	55,40,0), light brown (7.5YR 6/4), fi and (poorly graded), moderate nse, moist, angular to subangular rium)	ine	

BORING NUMBER CTIW-01D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV

		ECT NUM	BER 194	-87600014-N	/112	PROJECT LOCATION Henderson, NV
TREATABILITY LOGS.GPJ	ОЕРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING:IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTVALL CR TREATABILITY LOGS.GPJ	25 	MC MC	4-4-8 (12) 2-3-6 (9) 6-10-12 (22)	Cr VI = 140 Cr VI = 8.4 Dup = 12 Cl04- = 380 Dup = 400 Cr VI = 11 Cl04- = 400 Cr VI = 19 Cl04- = 720		(SM) Silty SAND, (5.55.40,0), light brown (7.5YR 6/4), fine to medium grained sand (poorly graded), dense, wet, angular to subangular gravet (~5mm), (Alluvium) (SM) Silty SAND, (5.55.40,0), light brown (7.5YR 6/4), fine to be decided to be decided, moderate cementation, very dense, moist, angular to subangular gravet (~5mm), (Alluvium) (ML) SILT, (0.19.90,0), light brown (7.5YR 6/4), medium plasticity, firm, moist, trace of fine subangular to subrounded gravet (~5mm), sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.19.90,0), light brown (7.5YR 6/4), medium plasticity, firm, woist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.19.90,0), light brown (7.5YR 6/4), medium plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,85,0), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,85,0), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf) (ML) SILT, (0.15,05), brown (7.5YR 5/4), high plasticity, firm, moist, sand content is fine to coarse grained. (UMCf)
						(Continued Next Page)

BORING NUMBER CTIW-01D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12

(tJ) 5	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	8-5-6 (11)	Cr VI = 20 Cl04- = 970		(ML) SILT, (0,15,85,0), brown (7.5YR 5/4), medium to high plasticity, hard, moist, small cemented nodules, sand content is medium to coarse grained. (UMCf)	
(#) 45 DEPTH	мс	5-7-8 (15)	Cr VI = 16 Cl04- = 520		(ML) SILT, (0,10,70,20), brown (7.5YR 4/4), high plasticity, firm, wet, sand content is fine grained. (UMCf)	 Hydrated Bentonite Chips
55	мс	6-14-17 (31)	Cr VI = 6.9 Cl04- = 610		(ML) SILT, (0,10,80,10), brown (7.5YR 4/4), low to medium plasticity, hard, moist, small cemented nodules, sand content is fine to medium grained. (UMCf)	
60	мс	19-22-40 (62)	Cr VI = 0.65 Cl04- = 120		(ML) SILT, (0,10,80,10), brown (7.5YR 4/4), low to medium plasticity, very hard, moist, small cemented nodules, sand content is fine to medium grained. (UMCf)	
					Bottom of borehole at 61.5 feet.	

BORING NUMBER CTIW-01S

PAGE 1 OF 2



- 1						rust (NERT)	PROJECT LOCATION I		m Treatabi	lity Study
_				<u>-87600014-</u> ;		PLETED _12/1/16	PROJECT LOCATION _ I GROUND ELEVATION	,	OLE SIZE	Q in
<u>ښ</u>						IC.				
ĭI				ow Stem A						
ו⊏					_	KED BY M. Crews	WATER LEVEL AFTER I	22.20 IL	/ Elev 1/3	<u>5.15 it</u>
ĖΙ		_				ated well box.				
X 보										
WIL.	_	SAMPLE TYPE NUMBER	့ တွေ့	ENVIRONMENTAL DATA	ပ္					
GINT	DEPTH (ft)	LE T MBE	ON INT	ATA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION		w	ELL DIAGRAM
OGS	8	MP	BLOW COUNTS (N VALUE)	/RO	GR/					
GRAM/BORING LOGS/	0	/S		EN L					Casing Typ	e: Schedule 40 PVC
NBOF		2000					n Gravel, (15,50,35,0), darl ne to medium grained sand			
6R8 -	4	[™] GB				graded), dense, dry,	angular gravel (<30mm), s	sample		
PR _O						collected with hand a	auger. (Alluvium)			
맑	1									
EST	4									
<u>-</u>										
	+									
TREATABILITY	5									
CR		[™] GB				(SM) Silty SAND, (5,	65,30,0), brown (7.5YR 5/3 d (poorly graded), dense, r	3), fine to		
라	4					angular gravel (<10n	nm), sample collected with			
<u>Q</u>						auger. (Alluvium).				
影	1									
 -										► Neat Cement Grout
Y-M										
# - -	+									
8760001	10									- 2" Schedule 40
S\876		V	6-13-17			(SM) Silty SAND, (10	0,65,25,0), brown (7.5YR 5 d (poorly graded), dense, r	5/4) fine to		PVC Well Casing
ᆰ	-	MC	(30)				ar gravel (<5mm). (Alluviun			
PRO										
카	+									
18FS1						(0.1) 6		(= =) (=		
TTS3						4/4), fine to coarse g	n Gravel, (15,55,30,0), brovrained sand (well graded),	dense,		
<u>-</u> -	+						pangular gravel (<35mm). (
7 12:47	15 _									
140/		V .	21-22-25				n Gravel, (15,55,30,0), browse grained sand (poorly gr			
	-	MC	(47)			dense, moist, angula	ar to subangular gravel (<1			
US.GDT				-		(Alluvium)				Hydrated Bentonite
삵	-									Chips
žL										
۳-۱										Cr VI - 18,000 ug/L
1	-					(SM) Silty SAND (5	55,40,0), light brown (7.5Y	'R 6/4), fine		Cl04 610,000
NEN MEN	20					to medium grained s	and (poorly graded), very	dense,		ug/L
핡		MC	50/4"	Cr VI = 0.7		moist, moderate cen gravel (<5mm). (Allu	nentation, angular to subar vium)	iguiar		⊷#2/16 Sand Filter Pack
Ž L				Dup = 0.98	'HHH		ontinued Next Page)			

BORING NUMBER CTIW-01S

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12

	LCI NON	IDLIX _134	-67000014-1	VIIZ	PROJECT LOCATION Heriderson, NV	
REATABILITY LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
FIELD PROGRAMBORING LOGSIGINTALL CR 7	мс	4-4-8 (12)	CI04- = 35 Dup = 58		(SM) Silty SAND, (5,55,40,0), light brown (7.5YR 6/4), fine to medium grained sand (poorly graded), dense, wet, angular to subangular gravel (<5mm). (Alluvium) (SM) Silty SAND, (5,55,40,0), light brown (7.5YR 6/4), fine to medium grained sand (poorly graded), very dense, moist, moderate cementation, angular to subangular gravel (<5mm). (Alluvium) (ML) SILT, (0,15,85,0), brown (7.5YR 5/4), low to medium plasticity, hard, moist to wet. (UMCf)	← Hydrated Bentonite Chips
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \\TTS318FS1/CES\PROJECTS\87600014-NERT-M12WORKING\N-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL CR TREATABILITY LOGS.GFU DEPTH (ft) (ft)						
ENVIRONMENTAL BH - GINT STD US						

BORING NUMBER CTIW-02D

PAGE 1 OF 3



-	CLIEN	IT Neva	da Environ	mental Resp	onse T	Trust (NERT)	PROJECT NAME NERT - In-Situ Chromiu	m Treatability Study
	PROJ	ECT NUM	MBER <u>194</u>	-87600014-1	M12		PROJECT LOCATION Henderson, NV	
GP.	DATE	STARTE	D 3/20/17		COMI	IPLETED 3/24/17	GROUND ELEVATION 1757.31 ft H	OLE SIZE 8 in
S S S	DRILL	ING CON	ITRACTOR	Cascade I	Drilling]	WATER LEVEL AT TIME OF DRILLING 22.	50 ft / Elev 1734.81 ft
Ĭ	DRILL	ING MET	HOD Holl	ow Stem Au	ger		WATER LEVEL AFTER DRILLING 22.52 ft	/ Elev 1734.79 ft
ABILI	LOGG	ED BY	Jeff Riches	on	CHEC	CKED BY M. Crews		
3EAT	NOTE	S Well o	completed v	with an 18" t	raffic-ra	rated well box.		
씽		111		¥				
SING LOGS/GINT/ALL	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION	WELL DIAGRAM Casing Type: Schedule 40 PVC
12:47 . \TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\IN-S\TU CR TREATABILITY TEST\FIELD PROGRAM\BORING L	5	MC MC	7-16-23	Cr VI = 0.16 Cl04- = 1500 Cr VI < = 0.2 Cl04- = 350 Cr VI < = 0.18 Cl04- = 18		(25,55,30), brown (7) sand, subangular to Air knife to 5' bgs (Ni (SW) Well Graded S (7.5YR 5/3), dry, loos sand, subangular to subrounded gravel, of (SW) Well Graded S (25,50,25), brown (7) graded sand, subang	ed SAND with Silt, (10,80,10,0) .5YR 4/3), dry, loose, well graded subrounded gravel. (Alluvium) o Recovery) .AND, (10,85,5,0) (30,40,30), brown se to medium dense, well graded rounded sand, subangular to gravel <1". (Alluvium) .AND with Gravel, (17,80,3,0) .5YR 5/4), dry, medium dense, well gular to rounded sand, subangular to gravel <1.5". (Alluvium)	Neat Cement Grout (5% Bentonite/95% Portland Cement) Neat Cement Grout (5% Bentonite/95% Portland Cement)
ONMENTAL BH - GINT STD US.GDT - 11/10/17 1	15	мс	20-25-27 (52)	Cr VI < = 0.16 Cl04- = 120		(7.5YR 5/4), moist, n subangular to rounde gravel, gravel <1". (A		Portland Cement)
ENVIR		MC	12-16-19	Cr VI < = 0.2		(SW) Well Graded S	AND, same as above. (Alluvium)	

BORING NUMBER CTIW-02D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV

PR	OJECT NUM	IBER _194	I-87600014-N	<i>I</i> 112	PROJECT LOCATION Henderson, NV	
TREATABILITY LOGS.GPJ	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - WITS318FS1/CESIPROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTALL CR TREATABILITY LOGS.GPJ	- MC	4-5-6 (11)	Cr VI = 7.7 Cl04- = 240	24	(SW) Well Graded SAND, same as above. (Alluvium) (continued) (SW) Well Graded SAND, same as above, wet, very weak cementation. (Alluvium) (SM) Silty SAND, (0,70,30,0) (40,30,30), strong brown (7.5YR 5/6), dense to very dense, moist, well graded subangular to rounded sand, strong cementation. (Alluvium) (ML) SILT with Sand, (0,15,85,0) (0,20,80), strong brown (7.5YR 5/6), soft to firm, moist, poorly graded subangular to rounded sand, non plastic, UMCf/Qal contact at 24' bgs. (UMCf) (ML) SILT, (0,5,85,10) (0,0,100), strong brown (7.5YR 5/6), soft to firm, wet from 26-29' bgs, moist from 29-30' bgs, low plasticity, few cemented nodules <0.5" diameter. (UMCf)	3
14-NERT-M12/WORKING\\N-S\TU CR	MC MC	3-7-10 (17)	Cr VI = 8.3 Cl04- = 290		(ML) SILT, (0,10,75,15) (0,0,100), strong brown (7.5YR 5/6), soft to firm, moist from 30-31' bgs, wet from 31-32' bgs, moist from 32-35' bgs, low to medium plasticity. (UMCf)	← Hydrated Bentonite Pellets
0/17 12:47 - \\TTS318FS1\CES\PROJECTS\876000'	MC	6-9-10 (19)	Cr VI = 8.9 Cl04- = 390		(ML) SILT, (0,10,75,15) (0,0,100), light brown (7.5YR 6/3), firm, wet, low to medium plasticity, strongly cemented nodules throughout 35-39' bgs, weak cementation between 39-40' bgs. (UMCf)	Cr VI - 20,000 ug/L Dup - 21,000 ug/L Cl04 890,000 ug/L Dup - 890,000 ug/L
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10	MC -	7-9-19 (28)	Cr VI = 12 Cl04- = 820	41.	No Recovery.	2" Schedule 40 PVC 0.020" Slotted Screen

BORING NUMBER CTIW-02D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

PROJECT LOCATION Henderson, NV

(J)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
-	МС	6-10-14 (24)	Cr VI = 13 Cl04- = 890		(ML) SILT, (0,10,65,25) (0,0,100), light brown (7.5YR 6/3), wet, firm to stiff, strongly cemented nodules throughout, medium plasticity, ~15% cemented nodules at 45-45.5' bgs. (UMCf)	
_					(ML) SILT, same as above, strong cementation, moist. (UMCf) (ML) SILT, same as above, no cementation/no nodules. (UMCf)	
50	мс	18-23-29 (52)				← Hydrated Bentonite Chips
Į.	<u>5</u> - -	5 MC	MC 6-10-14 (24)	MC 6-10-14 Cr VI = 13 Cl04- = 890	MC 6-10-14 Cr VI = 13 Cl04- = 890 MC 18-23-29 Cr VI = 6.7 Cl04- = 520 (52)	MC 6-10-14 (24) Cr VI = 13 (ML) SILT, (0,10,65,25) (0,0,100), light brown (7.5YR 6/3), wet, firm to stiff, strongly cemented nodules throughout, medium plasticity, ~15% cemented nodules at 45-45.5' bgs. (UMCf) (ML) SILT, same as above, strong cementation, moist. (UMCf) (ML) SILT, same as above, no cementation/no nodules. (UMCf) (ML) SILT, same as above, no cementation/no nodules. (UMCf) (ML) Sandy SILT, (0,40,60,5) (0,0,100), dark grayish brown (10YR 4/2), moist, stiff, very weak cementation, small clay nodules, poorly graded subangular to rounded

ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \\TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\\\IN-S\TJU CR TREATABILITY

BORING NUMBER CTIW-02S

PAGE 1 OF 2



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) PROJECT LOCATION Henderson, NV **PROJECT NUMBER** 194-87600014-M12 **DATE STARTED** 3/20/17 **COMPLETED** 3/27/17 **GROUND ELEVATION** 1757.45 ft HOLE SIZE 8 in DRILLING CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.95 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.49 ft / Elev 1734.96 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic-rated well box. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC 1.0 (SW-SM) Well Graded SAND with Silt, (10,80,10,0) GB 1756.5 (25,55,30), brown (7.5YR 4/3), dry, loose, well graded sand, subangular to subrounded sand. (Alluvium) Air knife to 5' bgs (No Recovery) 1752.5 5.0 (SW) Well Graded SAND, (10,85,5,0) (30,40,30), brown (7.5YR 5/3), dry, loose to medium dense, well graded 7-16-23 MC (39)sand, subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 2" Schedule 40 (SW) Well Graded SAND with Gravel, (17,80,3,0) **PVC Well Casing** 17-26-28 (25,50,25), brown (7.5YR 5/4), dry, medium dense, well MC (54)graded sand, subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) 15 (SW) Well Graded SAND, (10,87,3,0) (25,45,30), brown 20-25-27 (7.5YR 5/4), moist, medium dense, well graded MC subangular to rounded sand, subangular to subrounded (52)gravel, gravel <1". (Alluvium) Hydrated Bentonite Pellets Cr VI - 18,000 ug/L CI04- - 610,000 20 ug/L (SW) Well Graded SAND, same as above. (Alluvium) 12-16-19

BORING NUMBER CTIW-02S PAGE 2 OF 2 PROJECT NAME NERT - In-Situ Chromium Treatability Study



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NUMBER 194-87600014-M12

MATERIAL DESCRIPTION WELL DIAGRAM ### Pack ### Commitmed ### Co
(SW) Well Graded SAND, same as above, wel, very weak packed and pa
51

BORING NUMBER CTIW-03D

PAGE 1 OF 3



DATE STARTED 320/17 COMPLETED 3/27/17 GROUND ELEVATION 1/157.48 ft HOLE SIZE 8 in MATERIALD CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF CRILLING 22.50 ft / Elev 1/734.88 ft WATER LEVEL AT TIME OF CRILLING 22.50 ft / Elev 1/734.88 ft WATER LEVEL AFTER DRILLING 22.50 ft / Elev 1/							rust (NERT)	PROJECT NAME NERT - In-Situ Chromium Treatability Study PROJECT LOCATION Henderson, NV				
DRILLING CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.98 ft WATER LEVEL AT TIME OF DRILL	PROJECT NUMBER 194-87600014-M12 DATE STARTED 3/20/17 COMPLETE						PLETED 3/27/17	-	,	HOLE SIZE 8 in		
DRILLING METHOD Hollow Stem Auger	GS.G											
CHECKED BY M. Crews	의 스					_						
Material Description	-i						CKED BY M. Crews	WAILKLEVELATEK	<u> </u>	117 LICV 1704.00 IL		
Cr VI = 0.15	KEA!	NOTE	S Well	completed	with an 18"	traffic-ra	ated well box.					
Cr VI = 0.15	2		ш		.AL							
Cr VI = 0.15	AL M	工	T ER	TS UE)	ENT A	일						
Cr VI = 0.15	SIGIN	(#)	기년 JMB	SLO SUN VAL	ONIV DAT,	SAPI LOG	MATI	ERIAL DESCRIPTION		WELL DIAGRAM		
Cr VI = 0.15	i LOG		M N	mos	NK I	9						
Ciol4 = 1500	NEW NEW NEW NEW NEW NEW NEW NEW NEW NEW	0	<i>O</i>)		N N					Casing Type: Schedule 40 PV	′C	
Ciol4 = 1500	AM/BC		™ GB		Cr VI = 0.19	_ 9:•:• : - :-	(SW-SM) Well-Grad	led SAND with Silt and Gr	ravel, 1756	3.5		
Air knife to 5' bgs (No Recovery). Air knife to 5' bgs (No Recovery). Air knife to 5' bgs (No Recovery). 1752	3 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		V		Cl04- =	0 9 0 9	[\ (15,77,8,0), (30,35,3	5), brown (7.5YR 5/4), dry	y, loose, well 🗁 –			
MC	±]			:/ ·			
MC												
MC												
MC												
MC	EALA	5					5.0		1750			
to medium dense, very few weakly cemented nodules, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5°. (Alluvium) MC 13-18-37	<u>*</u>			44.00.50			(SW-SM) Well-Grad		avel,	2.5		
subrounded gravel, gravel <1.5". (Alluvium) MC 13-18-37			MC		0.16 Cl04- = 43		to medium dense, ve	ery few weakly cemented	nodules,			
10	2 2		/ \						angular to			
MC 13-18-37 Cr VI < = (SW) Well-Graded SAND with Silt and Gravel, (15,80,5,0), (25,50,25), brown (7.5YR 5/4), moist, loose to medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement)	Ž Y Y						graves,	grave. The r (r marram)				
MC 13-18-37 Cr VI < = (SW) Well-Graded SAND with Silt and Gravel, (15,80,5,0), (25,50,25), brown (7.5YR 5/4), moist, loose to medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement)	2/MC											
MC 13-18-37 Cr VI < = (SW) Well-Graded SAND with Silt and Gravel, (15,80,5,0), (25,50,25), brown (7.5YR 5/4), moist, loose to medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement)	- IM											
MC 13-18-37 Cr VI < = (SW) Well-Graded SAND with Silt and Gravel, (15,80,5,0), (25,50,25), brown (7.5YR 5/4), moist, loose to medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement)	4-NE											
MC 13-18-37 (55)	50001	10								2" Schedule 4	0	
dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) (SW-SM) Well-Graded SAND with Silt and Gravel, (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) MC 20-29-52 (81) MC 16-20-32 Cr VI < = 0.18	18/8/		V	13-18-37								
Neat Cement Grout (5% Bentonite/95% Portland Cement) MC 20-29-52) JEC		MC		Cl04- = 17		dense, well graded s	ubangular to rounded sar	nd,			
(5% Bentonite/95% Portland Cement) 15	2/LY						Suburigular to Subrot	anded graver, graver 11.0	. (/ waviam)			
(5% Bentonite/95% Portland Cement) 15	21/5											
(5% Bentonite/95% Portland Cement) 15	3181					*****						
(5% Bentonite/95% Portland Cement) 15										No-t Co	Cravit	
MC 20-29-52 (81) Cr VI <= 0.16 (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium)	2:47									(5% Bentonite	95%	
MC 20-29-52 (81) Clo4- = 350 (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium)	7	15			Cr VI < =		(SW-SM) Well-Grad	ed SAND with Silt and Gr	avel	Portland Cem	ent)	
dense, well graded subangular to founded sand, subangular to subrounded gravel, gravel <1". (Alluvium)	- 11/1		мс		0.16		(15,75,10,0) (20,40,4	40), brown (7.5YR 5/4), m	oist, medium			
MC 16-20-32 Cr VI < = 0.18 0.18	9			(81)	UIU4- = 350		subangular to subro	unded gravel, gravel <1".	iu, (Alluvium)			
MC 16-20-32 Cr VI < = 0.18 0.18	Si	_										
MC 16-20-32 Cr VI < = 0.18 0.18	ارد											
MC 16-20-32 Cr VI < = 0.18 0.18	<u></u>											
MC 16-20-32 Cr VI < = 0.18 0.18	ALBH	_										
MC 16-20-32 Cr VI < = 0.18 0.18	MEN!	20										
	NON Y	∠∪	V									
(Continued Next Page)	Į Į		MC	16-20-32	0.18							

BORING NUMBER CTIW-03D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV

	PROJECT NUMBER 194-87600014-M12			/112	PROJECT LOCATION Henderson, NV				
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM			
ENVIRONMENTAL BH - GINT S ID US, GDT - 11/10/17 12:47 - 1	MC MC	9-11-14 (25) 3-4-6 (10)	Cr VI = 8.4 Cl04- = 380 Cr VI = 11 Cl04- = 400		(SW-SM) Well-Graded SAND with Silt and Gravel, (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, well graded subangular to rounded sand, □ subangular to subrounded gravel, gravel <1". (Alluvium) (SW-SM) Well-Graded SAND with Silt and Gravel, (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, weak cementation, wet, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) (SW-SM) Well-Graded SAND with Silt and Gravel, (15,75,10,0) (20,40,40), brown (7.5YR 5/4), moist, medium dense, moderate cementation, moist, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) (ML) SILT, (0,10,90,0) (0,0,100), light brown (7.5YR 6/3), wet, moderate to strong cementation, non plastic, very stiff, UMCf/Qal contact at 24' bgs. (UMCf) (ML) SILT, (0,5,85,10) (0,0,100), strong brown (7.5YR 5/6), 25-26' bgs moist, 26-29' bgs wet, 29-30' bgs moist, soft to firm, low plasticity, very few strongly cemented nodules. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), strong brown (7.5YR 5/6), 30-31' bgs moist, 31-35' bgs wet, soft to firm, low plasticity, very few strongly cemented nodules. (UMCf)	► Hydrated Bentonite Pellets			
LEBH - GINT STD US.GDT - 11/10/17 12:47 - WITISSTBF STVCES/PROJECTS/BY600014	MC MC	4-7-7 (14) 4-6-8 (14)	Cr VI = 10 Cl04- = 720 Cr VI = 19 Cl04- = 1400		(ML) SILT, (0,10,70,20) (0,0,100), brown (7.5YR 5/4), wet, low to medium plasticity, soft to firm, strongly cemented nodules scattered throughout. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, low plasticity, soft to firm, strongly cemented nodules scattered throughout. (UMCf) (ML) Clayey SILT, (Elastic Silt), (0,10,65,30) (0,0,100), brown (7.5YR 5/4), wet, medium plasticity, soft to firm, strongly cemented nodules, weak cementation throughout, ~15-20% cemented nodules from 42-42.5' bgs. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen			
ENVIKONMENTA									

BORING NUMBER CTIW-03D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER _194-87600014-M12

TREATABILITY LOGS.GPJ DEPTH (ft) SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
O PROGRAMBORING LOGS/GINTALL CR	6-9-10 (19)	Cr VI = 20 Cl04- = 970		(ML) Clayey SILT, (Elastic Silt), (0,10,65,30) (0,0,100), strong brown (7.5YR 5/6), firm, medium plasticity, strongly cemented nodules. (UMCf)	
STYFIELD WO	8-12-14 (26)	Cr VI = 16 Cl04- = 520)	(ML) SILT, (0,25,60,15) (0,0,100), brown (7.5YR 5/4), firm, low plasticity, moist, ditto, some clay nodules. (UMCf)	← Hydrated Bentonite Pellets
⊭ / 1	(20)		51.5		706.0 Pellets
ABILIT				Bottom of borehole at 51.5 feet.	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - WITS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR TREATABILITY LOGS.GDP (ft) DEPTH Grant Control of the control					

BORING NUMBER CTIW-03S

PAGE 1 OF 2



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) PROJECT LOCATION Henderson, NV **PROJECT NUMBER** 194-87600014-M12 HOLE SIZE 8 in DATE STARTED 3/20/27 **COMPLETED** 3/27/17 **GROUND ELEVATION** 1757.32 ft TREATABILITY LOGS.GP. DRILLING CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.82 ft **DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.53 ft / Elev 1734.79 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic-rated well box. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC 1.0 (SW-SM) Well Graded SAND with Silt and Gravel. GB 1756.3 (15,77,8,0) (30,35,35) 7.5YR 5/4 Brown, dry, loose, well graded subangular to rounded sand. (Alluvium) Air knife to 5' bgs (No Recovery). 1752.3 5.0 (SW-SM) Well Graded SAND with Silt and Gravel. (15,75,10,0) (30,35,35) 7.5YR 5/4 Brown, moist, loose to 14-29-50 MC medium dense, very few weakly cemented nodules, well (79)graded subangular to rounded sand, subangular to subrounded gravel, gravel <1.5". (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 2" Schedule 40 (SW) Well Graded SAND with Gravel. (15,80,5,0) **PVC Well Casing** 13-18-37 (25,50,25) 7.5YR 5/4 Brown, moist, loose to medium MC (55)dense, well graded subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) 15 (SW-SM) Well Graded SAND with Silt and Gravel 20-29-52 (15,75,10,0) (20,40,40) 7.5YR 5/4 Brown, moist, medium MC dense, well graded subangular to rounded sand, (81)subangular to subrounded gravel, gravel <1". (Alluvium) Hydrated Bentonite Pellets Cr VI - 18,000 ug/L CI04- - 610,000 20 ug/L (SW-SM) Same as above. Well Graded Sand with Silt 16-20-32 and Gravel. (Alluvium)

BORING NUMBER CTIW-03S

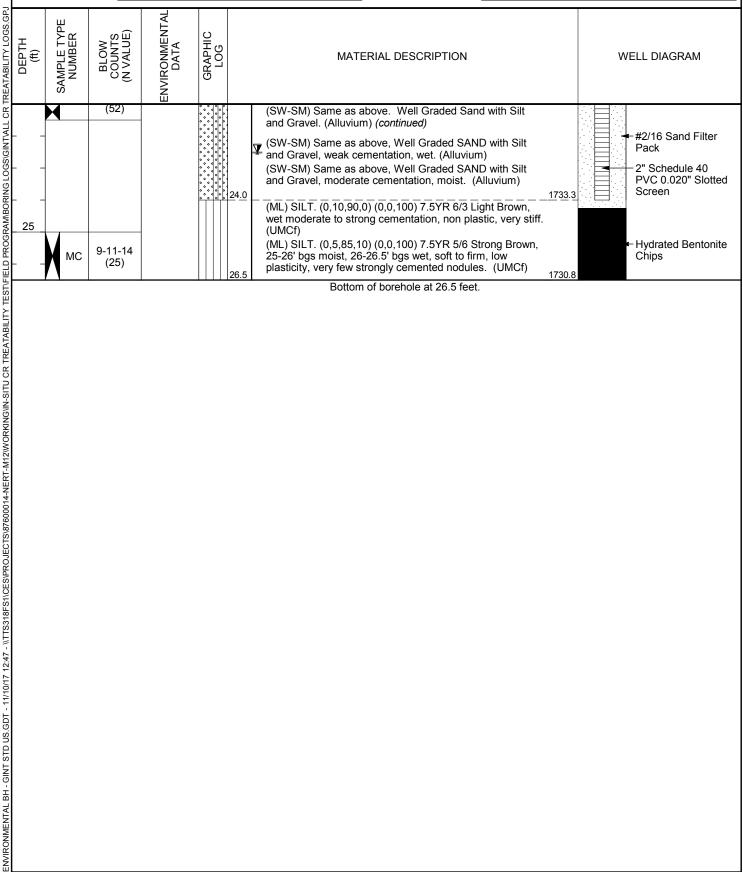
PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12



BORING NUMBER CTMW-01D

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV HOLE SIZE 12 in **DATE STARTED** 3/20/17 **COMPLETED** 3/21/17 GROUND ELEVATION 1757.14 ft LOGS.GP. **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.64 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.37 ft / Elev 1734.77 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = М Gь 0.5 0.17 (SW) Well-Graded SAND, (10,87,3,0) (20,70,10), brown Cl04- = 6.7 1756.1 (7.5 YR 5/4), dry, loose, well-graded gravel and sand, subangular to round gravel and sand. (Alluvium) Air knife to 5' bgs (No Recovery). 1752.1 5.0 (SW) Well-Graded SAND with Gravel, (15,82,3,0) Cr VI < = 0.17 (25,50,25), same as above except medium dense to MC 16-19-32 C104 - = 160dense, gravel <3". (Alluvium) (51)Neat Cement Grout (5% Bentonite/95 % (SW) Well-Graded SAND with Gravel, (15,82,3,0) Portland Cement) (20,40,40), same as above except medium dense to dense, gravel <3". (Alluvium) 10 2" Schedule 40 Cr VI < = (SW) Well-Graded SAND, (10,90,5,0) (30,40,30), brown PVC. Well Casing. 14-23-35 0.16 MC (7.5YR 5/4), moist, medium dense to dense, well graded CI04- = 190 (58)gravel and sand, subangular to subround gravel and sand, gravel <3". (Alluvium) 15 (SW-SM) Well-Graded SAND with Silt, (10,90,5,0) Cr VI < = MC 26-44-47 0.16 (30,60,10), same as above, silt content increases to 10% C104 - 54015 at 20.5'. (Alluvium) (91)Hydrated Bentonite Pellets 20 Cr VI = 1.8 CI04 - = 24012-29-48

BORING NUMBER CTMW-01D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV

DEPTH (ff) (ff) SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE) ENVIRONMENTAL DATA	GRAPHIC LOG			
= 4.00		GR/ L	MATERIAL DESCRIPTION WELL D		
HAT A STANDARD AND COLOR THE ALL AND COLOR OF THE A	Cr VI = 4. 17-26-39 (65)		(SW-SM) Well Graded SAND with Silt, (10,85,10,0) (30,60,10), same as above, strong cementation and cemented nodules present. (Alluvium) (SW) Well-Graded SAND with Gravel, (15,80,5,0) (33,33,34), brown (7.5YR 5/4), wet, medium dense, well graded sand, subangular to round sand and gravel, gravel <1". (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), medium dense to dense, wet, some cemented nodules <1", low plasticity. (UMCf) (ML) SILT, (0,10,87,3) (0,0,100), light brown (7.5YR 6/4), medium dense, wet, non plastic. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen	
30 MC 30	Cr VI = 1: 4-7-10 Cl04- = 43		(ML) SILT, (0,5,95,0) (0,0,100), strong brown (7.5YR 5/6), firm to stiff, wet, non plastic. (UMCf)	Hydrated Bentonite Pellets	
35 MC 1	Cr VI = 9. 11-13-17 Cl04- = 53		(ML) SILT, (0,5,95,0) (0,0,100), strong brown (7.5YR 5/6), firm to stiff, wet, non plastic. (UMCf) (ML) SILT, (0,5,55,45) (0,0,100), brown (7.5YR 4/4), medium to high plasticity, wet, stiff, some cemented nodules, elastic silt. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100) same as 30-35' bgs. (UMCf)		
40 MC 2	Cr VI = 13 20-29-32 (61)		(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, very stiff, low plasticity. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen	
			(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, very stiff, low plasticity, with very small cemented		

BORING NUMBER CTMW-01D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
RAM/BORING LOGS/GINTALL CR	MC 45	13-15-23 (38)	Cr VI = 13 Cl04- = 750	-	nodules. (UMCf) (ML) SILT, same as 40-44' bgs, stiff to very stiff. (UMCf)	
R TREATABILITY TEST/FIELD PROG	MC 50	14-19-23 (42)	Cr VI = 13 Cl04- = 570	-	(ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff. (UMCf)	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \textites 1/8FS1/GESI/PROJECTS/87/600014-NERT-M12/WORKING\in\textites 1/2 \textites 1/10/17 12:47 - \textites 1/10/17 12	MC 55	15-26-41 (67)	Cr VI = 11 Dup = 9.7 Cl04- = 710 Dup = 580		(ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff, with cemented nodules. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff. (UMCf) (ML) SILT, same as above with increase in cemented nodules-white to grey in color, approximately 15-20% of core comprised of cemented nodules. (UMCf) (ML) SILT, same as above 50-54.5, small weakly cemented nodules pervasive throughout interval. (UMCf)	Hydrated Bentonite Chips
- MI 18318F 57 CE 58 F 40 J E C	MC 60	7-10-16 (26)	Cr VI = 10 Cl04- = 950		(ML) SILT, same as above, firm to stiff. (UMCf) 1.5 Bottom of borehole at 61.5 feet.	1695.6
J 08.GDI - 11/10/17 12:47 -						
NVIRONMENTAL BH - GINT OF						

BORING NUMBER CTMW-01S

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV HOLE SIZE 12 in **DATE STARTED** 3/20/17 **COMPLETED** 3/21/17 GROUND ELEVATION 1757.16 ft LOGS.GP. **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.66 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.21 ft / Elev 1734.95 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = М Gь 0.5 0.17 (SW) Well-Graded SAND, (10,87,3,0) (20,70,10), brown Cl04- = 6.7 1756.2 (7.5 YR 5/4), dry, loose, well-graded gravel and sand, subangular to round gravel and sand. (Alluvium) Air knife to 5' bgs (No Recovery). 1752.2 5.0 (SW) Well-Graded SAND with Gravel, (15,82,3,0) Cr VI < = 0.17 (25,50,25), same as above except medium dense to MC 16-19-32 C104 - = 160dense, gravel <3". (Alluvium) 5 (51)Neat Cement Grout (5% Bentonite/95 % (SW) Well-Graded SAND with Gravel, (15,82,3,0) Portland Cement) (20,40,40), same as above except medium dense to dense, gravel <3". (Alluvium) 10 2" Schedule 40 Cr VI < = (SW) Well-Graded SAND, (10,90,5,0) (30,40,30), brown PVC. Well Casing. 14-23-35 0.16 MC (7.5YR 5/4), moist, medium dense to dense, well graded CI04- = 190 (58)gravel and sand, subangular to subround gravel and sand, gravel <3". (Alluvium) 15 (SW-SM) Well-Graded SAND with Silt, (10,90,5,0) Cr VI < = MC 26-44-47 0.16 (30,60,10), same as above, silt content increases to 10% C104 - 54015 at 20.5'. (Alluvium) (91)Hydrated Bentonite Pellets 20 Cr VI = 1.8 CI04 - = 24012-29-48

BORING NUMBER CTMW-01S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

	JMBER <u>194</u>	1-87600014-I	VIIZ	PROJECT LOCATION Henderson, NV	
DEPTH (ft) SAMPLE TYPE NUMBER		ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
H1(#) 25 MC25 MC	C 17-26-39	Cr VI = 4.8 Cl04- = 140		(SW-SM) Well Graded SAND with Silt, (10,85,10,0) (30,60,10), same as above, strong cementation and cemented nodules present. (Alluvium) (SW) Well-Graded SAND with Gravel, (15,80,5,0) (33,33,34), brown (7.5YR 5/4), wet, medium dense, well graded sand, subangular to round sand and gravel, gravel <1". (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), medium dense to dense, wet, some cemented nodules <1", low plasticity. (UMCf) (ML) SILT, (0,10,87,3) (0,0,100), light brown (7.5YR 6/4), medium dense, wet, non plastic. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
30 MG		Cr VI = 11 Cl04- = 430	-	(ML) SILT, (0,5,95,0) (0,0,100), strong brown (7.5YR 5/6), firm to stiff, wet, non plastic. (UMCf)	
35 MM		Cr VI = 9.4 Cl04- = 530		(ML) SILT, (0,5,95,0) (0,0,100), strong brown (7.5YR 5/6), firm to stiff, wet, non plastic. (UMCf) (ML) SILT, (0,5,55,45) (0,0,100), brown (7.5YR 4/4), medium to high plasticity, wet, stiff, some cemented nodules, elastic silt. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100) same as 30-35' bgs.	
40 MC		Cr VI = 13 Cl04- = 600	-	(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, very stiff, low plasticity. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
45				(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, very stiff, low plasticity, with very small cemented	

BORING NUMBER CTMW-01S

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12

TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
RAMIBORING LOGS/GINTALL CR	MC 45	13-15-23 (38)	Cr VI = 13 Cl04- = 750	-	nodules. (UMCf) (ML) SILT, same as 40-44' bgs, stiff to very stiff. (UMCf)	
R TREATABILITY TESTIFIELD PROG	MC 50	14-19-23 (42)	Cr VI = 13 Cl04- = 570	-	(ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff. (UMCf)	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - NITS318FS1/GESI/PROJECTS/87/600014-NERT-M12/WORKINGIN-SITU CR. TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR. TREATABILITY LOGS.GB., Part	MC 55	15-26-41 (67)	Cr VI = 11 Dup = 9.7 Cl04- = 710 Dup = 580		(ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff, with cemented nodules. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), same as above, stiff to very stiff. (UMCf) (ML) SILT, same as above with increase in cemented nodules-white to grey in color, approximately 15-20% of core comprised of cemented nodules. (UMCf) (ML) SILT, same as above 50-54.5, small weakly cemented nodules pervasive throughout interval. (UMCf)	Hydrated Bentonite Chips
	MC 60	7-10-16 (26)	Cr VI = 10 Cl04- = 950		(ML) SILT, same as above, firm to stiff. (UMCf) Bottom of borehole at 61.5 feet.	1695.7
U.S. GUI - 11/10/17 12:47 -						
NVIKONMENIAL BH - GINI 31						

BORING NUMBER CTMW-02D

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV HOLE SIZE 12 in **DATE STARTED** 3/20/17 **COMPLETED** 3/23/17 **GROUND ELEVATION** 1757.26 ft **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.76 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.72 ft / Elev 1734.54 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH € MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = 0.16 (SW) Well-Graded SAND with Gravel, (15,81,4,0) GB Cl04- = 0.7 (25,25,50), brown (7.5YR 5/4), dry loose, well graded sand and gravel, subangular to rounded gravel and sand. (Alluvium) Air knife to 5' bgs (no recovery) 1752.3 5.0 (SW) Well Graded SAND with Gravel, (15,82,3,0) Cr VI < = 0.17 (30,50,20) brown (7.5YR 5/4), dry, medium dense, well 18-26-29 MC C104 - =(55)graded gravel and sand, subangular to rounded sand, 1800 subangular to subrounded gravel, <3" gravel. (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 2" Schedule 40 Cr VI < = (SW) Well Graded SAND with Gravel, (20,75,5,0) **PVC** 12-17-25 0.16 (30,50,20), brown (7.5YR 4/3), dry, loose to medium MC (42)C104 - = 420dense, well graded gravel and sand, subangular to rounded sand, subangular to subrounded gravel, gravel <3". (Alluvium) 15 (SW-SM) Well Graded SAND with Silt and Gravel, Cr VI < = 21-26-37 0.16 (15,70,15,0) (20,30,50), brown (7.5YR 4/3), dry from MC C104 - = 26015-18.5, moist from 18.5-20, medium dense, subangular (63)to rounded sand, well graded gravel and sand, subangular to subrounded gravel, gravel <2". (Alluvium) Hydrated Bentonite Pellets 20 #2/16 Sand Filter Cr VI = 1.4 Pack C104 - = 58019-31-42

BORING NUMBER CTMW-02D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

1			-87600014-1		PROJECT LOCATION Henderson, NV
TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION WELL DIAGRAM
LCR		(73)			(SW-SM) Well Graded SAND with Silt and Gravel, (15,70,15,0) (20,30,50), brown (7.5YR 4/3), dry from
PROGRAMIBORING LOGS/GINTAL	М мс	4-5-7	Cr VI = 1.7 Cl04- = 87		15-18.5, moist from 18.5-20, medium dense, subangular to rounded sand, well graded gravel and sand, subangular to subrounded gravel, gravel <2". (Alluvium) (continued) (SM) SILT, (3,82,15,0) (40,30,30), brown (7.5YR 5/4), moist, well graded gravel and sand, medium dense, subangular to rounded sand, subangular to subrounded gravel, gravel <0.5", strong cementation. (Alluvium) (SW-SM) Well Graded SAND with Silt, (3,87,10,0) same as above, weak cementation, wet, silt content decreases to 10%. (Alluvium) (SM) Silty SAND, same as 21.5-22' bgs, UMCf/Qal contact
ITU CR TREATABILITY TESTIFIELD 100	-	(12)			26.5 (ML) SILT, (0,10,90,0) (0,15,85), light brown (7.5YR 6/4), moist, poorly graded sand, subangular to rounded sand, weakly cemented, soft to firm. (UMCf) (ML) SILT, (0,10,90,0) (0,10,90), light brown (7.5YR 6/4), wet from 25-25.5' bgs, moist from 25.5-26.5' bgs, soft to firm, poorly graded sand, subangular to rounded sand. (UMCf) No Recovery Hydrated Bentonite Pellets
TS/87600014-NERT-M12/WORKING/IN-S/	мс	3-6-6 (12)	Cr VI = 9.5 Dup = 11 Cl04- = 410 Dup = 380		(ML) SILT, (0,10,80,10) (0,5,95), brown (7.5YR 5/4), wet from 30-34' bgs, moist from 34-35' bgs, soft to firm, poorly graded subangular to rounded sand, low plasticity. (UMCf)
ENVIRONMENTAL BH - GINT STD US,GDT - 11/10/17 12:47 - NTTS318FS1/CES/PROJECTS/87600014-NERT-M72/WORKINGNIN-SITU CR TREATABILITY LOGS,GEN TALL CR TREATABILITY LOGS,GEN TO STATE TO STAT	мс	5-18-26 (44)	Cr VI = 6.2 Cl04- = 290		(ML) SILT, (0,10,75,15) (0,0,100), strong brown (7.5YR 5/6), wet from 35-37' bgs, moist from 37-40' bgs, few strongly cemented nodules throughout, low plasticity. (UMCf)
IMENTAL BH - GINT STD US.GDT - 1	мс	2-7-8 (15)	Cr VI = 13 Cl04- = 1100		(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 40-41.5' bgs, wet from 41.5-42.5' bgs, moist from 42.5-43' bgs, wet from 43-44' bgs, moist from 44-45' bgs, weak cementation throughout with few strongly cemented nodules, soft to firm, low plasti #2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
45_					

BORING NUMBER CTMW-02D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

TREATABILITY LOGS.GP DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
IGRAM/BORING LOGS/GINT/ALL CR T	мс	4-5-10 (15)	Cr VI = 17 Cl04- = 1100		(ML) SILT, (0,10,70,20) (0,0,100) brown (7.5YR 4/4), moist from 45-48' bgs, wet from 48-48.5' bgs, moist from 48.5-50' bgs, soft to firm, few strongly cemented nodules, low to medium plasticity. (UMCf)	
TU CR TREATABILITY TESTVFIELD PRO	мс	6-11-15 (26)	Cr VI = 13 Cl04- = 650		(ML) SILT, (0,5,60,35) (0,0,100), brown (7.5YR 5/4), moist from 50-52' bgs, wet from 52-52.5' bgs, moist from 52.5-54' bgs, wet from 54-54.5' bgs, moist from 54.5-55' bgs, firm to stiff, weak cementation from 50-51' bgs with a few large (2") strongly cemented	
11CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TESTYFIELD PROGRAMMBORING LOGS/GINTALL CR TREATABILITY LOGS/GRUDOS/GINTALL CR TREATABILITY LOGS/GRUDOS/GINTALL CR TREATABILITY LOGS/GRUDOS/G	мс	3-18-25 (43)	Cr VI = 9.2 Cl04- = 430		(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 55-55.5' bgs, wet from 55.5-66' bgs, moist from 56-60' bgs, stiff to very stiff, low plasticity, strongly cemented nodules throughout (<1"), ~15% of core from 59-60' bgs is comprised of cemented n	Hydrated Bentonite Chips
10/17 12:47 - NTTS318FS1/CES/PROJEC	МС	9-12-21 (33)	Cr VI = 1.8 Cl04- = 340		(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 55-55.5' bgs, wet from 55.5-56' bgs, moist from 56-60' bgs, stiff to very stiff, low plasticity, strongly cemented nodules throughout (<1"), ~15% of core from 59-60' bgs is comprised of cemented n Bottom of borehole at 61.5 feet.	3
ENVIRONMENTAL BH - GINT STD US,GDT - 11/10/17 12:47\TTS318FS;						

BORING NUMBER CTMW-02S

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV HOLE SIZE 12 in **DATE STARTED** 3/20/17 **COMPLETED** 3/23/17 **GROUND ELEVATION** 1757.21 ft **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.71 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.47 ft / Elev 1734.74 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH € MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = 0.16 (SW) Well-Graded SAND with Gravel, (15,81,4,0) GB Cl04- = 0.7 (25,25,50), brown (7.5YR 5/4), dry loose, well graded sand and gravel, subangular to rounded gravel and sand. (Alluvium) Air knife to 5' bgs (no recovery) 1752.2 5.0 (SW) Well Graded SAND with Gravel, (15,82,3,0) Cr VI < = 0.17 (30,50,20) brown (7.5YR 5/4), dry, medium dense, well 18-26-29 MC C104 - =(55)graded gravel and sand, subangular to rounded sand, 1800 subangular to subrounded gravel, <3" gravel. (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 2" Schedule 40 Cr VI < = (SW) Well Graded SAND with Gravel, (20,75,5,0) **PVC** 12-17-25 0.16 (30,50,20), brown (7.5YR 4/3), dry, loose to medium MC (42)C104 - = 420dense, well graded gravel and sand, subangular to rounded sand, subangular to subrounded gravel, gravel <3". (Alluvium) 15 (SW-SM) Well Graded SAND with Silt and Gravel, Cr VI < = 21-26-37 0.16 (15,70,15,0) (20,30,50), brown (7.5YR 4/3), dry from MC C104 - = 26015-18.5, moist from 18.5-20, medium dense, subangular (63)to rounded sand, well graded gravel and sand, subangular to subrounded gravel, gravel <2". (Alluvium) Hydrated Bentonite Pellets 20 #2/16 Sand Filter Cr VI = 1.4 Pack C104 - = 58019-31-42

BORING NUMBER CTMW-02S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

1	OLOT HON	<u> 10-</u>	-87600014-1	VIIZ	PROJECT LOCATION Henderson, NV
TREATABILITY LOGS.GP. DEPTH (#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION WELL DIAGRAM
L CF		(73)			(SW-SM) Well Graded SAND with Silt and Gravel, (15,70,15,0) (20,30,50), brown (7.5YR 4/3), dry from
PROGRAM/BORING LOGS/GINT/AL	M MC	4-5-7	Cr VI = 1.7 Cl04- = 87		15-18.5, moist from 18.5-20, medium dense, subangular to rounded sand, well graded gravel and sand, subangular to subrounded gravel, gravel <2". (Alluvium) (continued) (SM) SILT, (3,82,15,0) (40,30,30), brown (7.5YR 5/4), moist, well graded gravel and sand, medium dense, subangular to rounded sand, subangular to subrounded gravel, gravel <0.5", strong cementation. (Alluvium) (SW-SM) Well Graded SAND with Silt, (3,87,10,0) same as above, weak cementation, wet, silt content decreases to 10%. (Alluvium) (SM) Silty SAND, same as 21.5-22' bgs, UMCf/Qal contact
ITU CR TREATABILITY TESTIFIELD 100	-	(12)			at 24' bgs. (Alluvium) (ML) SILT, (0,10,90,0) (0,15,85), light brown (7.5YR 6/4), moist, poorly graded sand, subangular to rounded sand, weakly cemented, soft to firm. (UMCf) (ML) SILT, (0,10,90,0) (0,10,90), light brown (7.5YR 6/4), wet from 25-25.5' bgs, moist from 25.5-26.5' bgs, soft to firm, poorly graded sand, subangular to rounded sand. (UMCf) No Recovery
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \ Articles/PROJECTS/B7600014-NERT-M12WORKING/IN-S/ITU CR TREATABILITY TEST-FIELD PROGRAM/BORING LOGS/GINT/ALL CR TREATABILITY LOGS/GR/LAND LOGS/GINT/ALL CR TREATABILITY LOGS/GR/LAND LOG	MC MC	3-6-6 (12)	Cr VI = 9.5 Dup = 11 Cl04- = 410 Dup = 380		(ML) SILT, (0,10,80,10) (0,5,95), brown (7.5YR 5/4), wet from 30-34' bgs, moist from 34-35' bgs, soft to firm, poorly graded subangular to rounded sand, low plasticity. (UMCf)
11/10/17 12:47 - WITS318FS1/CESVPROJECT	MC	5-18-26 (44)	Cr VI = 6.2 Cl04- = 290		(ML) SILT, (0,10,75,15) (0,0,100), strong brown (7.5YR 5/6), wet from 35-37' bgs, moist from 37-40' bgs, few strongly cemented nodules throughout, low plasticity. (UMCf)
MENTAL BH - GINT STD US.GDT - 1	MC	2-7-8 (15)	Cr VI = 13 Cl04- = 1100		(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 40-41.5' bgs, wet from 41.5-42.5' bgs, moist from 42.5-43' bgs, wet from 43-44' bgs, moist from 44-45' bgs, weak cementation throughout with few strongly cemented nodules, soft to firm, low plasti - #2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
NON A					

BORING NUMBER CTMW-02S





CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER _194-87600014-M12

TEXTRELITY COSSIGN 4 DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	4-5-10 (15)	Cr VI = 17 Cl04- = 1100		(ML) SILT, (0,10,70,20) (0,0,100) brown (7.5YR 4/4), moist from 45-48' bgs, wet from 48-48.5' bgs, moist from 48.5-50' bgs, soft to firm, few strongly cemented nodules, low to medium plasticity. (UMCf)	
HT DEPTH (#) (#) (#) (#) (#) (#) (#) (#) (#) (#)	MC	6-11-15 (26)	Cr VI = 13 Cl04- = 650		(ML) SILT, (0,5,60,35) (0,0,100), brown (7.5YR 5/4), moist from 50-52' bgs, wet from 52-52.5' bgs, moist from 52.5-54' bgs, wet from 54-54.5' bgs, moist from 54.5-55' bgs, firm to stiff, weak cementation from 50-51' bgs with a few large (2") strongly cemented	
55	MC	3-18-25 (43)	Cr VI = 9.2 Cl04- = 430		(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 55-55.5' bgs, wet from 55.5-56' bgs, moist from 56-60' bgs, stiff to very stiff, low plasticity, strongly cemented nodules throughout (<1"), ~15% of core from 59-60' bgs is comprised of cemented n	→ Hydrated Bentonite Chips
60	мс	9-12-21 (33)	Cr VI = 1.8 Cl04- = 340	-	(ML) SILT, (0,10,75,15) (0,0,100) brown (7.5YR 4/4), moist from 55-55.5' bgs, wet from 55.5-56' bgs, moist from 56-60' bgs, stiff to very stiff, low plasticity, strongly cemented nodules throughout (<1"), ~15% of core from 59-60' bgs is comprised of cemented n Bottom of borehole at 61.5 feet.	2

BORING NUMBER CTMW-03D

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV **DATE STARTED** 11/30/16 **COMPLETED** 12/1/16 GROUND ELEVATION 1757.23 ft HOLE SIZE 12 in TREATABILITY LOGS.GP. DRILLING CONTRACTOR National EWP, Inc. WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.73 ft **DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.43 ft / Elev 1734.80 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH € MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = (SM) Silty SAND with Gravel, dark yellowish brown (10YR GB 4/4), (15,50,35,0), fine to coarse grained sand, dense, dry, 0.16 CI04 - = 0.7angular gravel (<30mm), sample collected with hand auger. (Alluvium) 5 Cr VI < = (SM) Sity SAND, brown (7.5YR 5/3), (10,65,25,0), fine to GB 0.17 medium grained sand (poorly graded), dense, moist, C104 - =angular gravel (<10mm), sample collected with hand 1800 auger. (Alluvium) Neat Cement Grout 10 2" Schedule 40 Cr VI < = (SM) Silty SAND, brown (7.5YR 5/4), (10,60,30,0), fine to **PVC Well Casing** 0.16 12-14-16 medium grained sand (poorly graded), dense, weak MC CI04 - = 420(30)cementation, moist, angular to subangular gravel (<10mm). (Alluvium) 15 Cr VI < = (SM) Sity SAND, brown (7.5 YR 5/4), (10,70,20,0), fine to 18-20-22 0.16 coarse grained sand (well graded), dense, moist, angular МС C104 - = 260to subangular gravel (<30mm). (Alluvium) (42)Hydrated Bentonite Chips 20 #2/16 Sand Filter Cr VI = 1.4 Pack C104 - = 58018-29-29

BORING NUMBER CTMW-03D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

		DEIX _10+	-67000014-1	VIIZ	PROJECT LOCATION Henderson, NV	
TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - NTS318FS1/CES/PROJECTS/87600014-NERT-M12WORKING/IN-S/ITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINT/ALL CR TREATABILITY LOGS.GPJ C	MC MC	(58) 14-15-20 (35) 4-7-9 (16)	Cr VI = 1.7 Cl04- = 87 Cr VI = 9.5 Dup = 11 Cl04- = 410 Dup = 380 Cr VI = 6.2 Cl04- = 290		(SM) Sitty SAND, light brown (7.5 YR 6/4), (5,75,20,00, fine to medium grained sand (poorly graded), dense, moist, angular to subangular gravel (<5mm). (Alluvium) (35,55,10,0), fine to coarse grained sand (well graded), medium dense, wet, angular to subangular well graded gravel (<15mm). (Alluvium) (SM) SAND with Gravel, light brown (7.5 YR 6/4), (5,75,20,0), fine to medium grained sand (poorly graded), dense, moist, angular to subangular gravel (<5mm). (Alluvium) (ML) SILT, brown (7.5 YR 5/4), (0,15,85,0), medium plasticity, firm, moist, fine to coarse grained sand. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, hard, moist, fine to coarse grained sand. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (2,15,83,0), low to medium plasticity, hard, wet, fine to coarse grained sand, subangular to subrounded gravel (<5mm). (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, hard, wet, fine to coarse grained sand, subangular to subrounded gravel (<5mm). (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, hard, moist, fine to coarse grained. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, firm, wet, fine to coarse grained. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, firm, wet, fine to coarse grained. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,5,70,25), high plasticity, firm, wet, fine to coarse grained. (UMCf) (ML) SILT, brown (7.5 YR 5/4), (0,15,70,15), medium plasticity, firm, moist, medium to coarse grained sand. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.010" Slotted Screen #2/16 Sand Filter Pack 2" Schedule 40 PVC 0.010" Slotted Screen
ENVIRONMENTA 					(Continued Next Page)	

BORING NUMBER CTMW-03D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

(JJ) (JJ) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	МС	6-8-9 (17)	Cr VI = 17 Cl04- = 1100		(ML) SILT, brown (7.5YR 5/4), (5,10,75,10), medium plasticity, hard, wet, medium to coarse grained sand, angular to subangular gravel (<15mm). (UMCf) (continued) (ML) SILT, brown (7.5YR 5/4), (5,10,70,15), medium plasticity, hard, wet, coarse sand, angular to subangular gravel (<10mm). (UMCf)	
50	МС	4-5-5 (10)	Cr VI = 13 Cl04- = 650		(ML) SILT, brown (7.5YR 4/4), (0,5,70,250, high plasticity, firm, moist, fine grained sand. (UMCf) (ML) SILT, brown (7.5YR 4/4), (5,10,75,10), medium plasticity, hard with small cemented nodules, moist,	≺Hydrated Bentonite Chips
55	МС	7-9-10 (19)	Cr VI = 9.2 Cl04- = 430		medium to coarse grainedn sand, angular to subangular gravel (<5mm). (UMCf)	
60	МС	27-39-40 (79)	Cr VI = 1.8 Cl04- = 340		(ML) SILT, very pale brown (10YR 7/3), (5,10,80,5), low to medium plasticity, hard with small cemented nodules, moist, coarse grained sand, angular to subangular gravel (<5mm). (UMCf) Bottom of borehole at 61.5 feet.	

BORING NUMBER CTMW-03S

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV **DATE STARTED** 11/30/16 **COMPLETED** 12/1/16 GROUND ELEVATION 1757.21 ft HOLE SIZE 12 in TREATABILITY LOGS.GP. DRILLING CONTRACTOR National EWP, Inc. WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.71 ft **DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.36 ft / Elev 1734.85 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH € MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = (SM) Silty SAND with Gravel, dark yellowish brown (10YR GB 4/4), (15,50,35,0), fine to coarse grained sand, dense, dry, 0.16 CI04 - = 0.7angular gravel (<30mm), sample collected with hand auger. (Alluvium) 5 Cr VI < = (SM) Sity SAND, brown (7.5YR 5/3), (10,65,25,0), fine to GB 0.17 medium grained sand (poorly graded), dense, moist, C104 - =angular gravel (<10mm), sample collected with hand 1800 auger. (Alluvium) Neat Cement Grout 10 2" Schedule 40 Cr VI < = (SM) Silty SAND, brown (7.5YR 5/4), (10,60,30,0), fine to **PVC Well Casing** 0.16 12-14-16 medium grained sand (poorly graded), dense, weak MC CI04 - = 420(30)cementation, moist, angular to subangular gravel (<10mm). (Alluvium) 15 Cr VI < = (SM) Sity SAND, brown (7.5 YR 5/4), (10,70,20,0), fine to 18-20-22 0.16 coarse grained sand (well graded), dense, moist, angular МС C104 - = 260to subangular gravel (<30mm). (Alluvium) (42)Hydrated Bentonite Chips 20 #2/16 Sand Filter Cr VI = 1.4 Pack C104 - = 58018-29-29

BORING NUMBER CTMW-03S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ICESIPROJECTS/87600014-NERT-M12/WORKING/IN-S/TU CR TREATABILITY TESTFIELD PROGRAM/BORING LOGS/GINTALL CR TREATABILITY LOGS/GFU S O (#)	MC	(58) 14-15-20 (35)	Cr VI = 1.7 Cl04- = 87		(SM) Sitty SAND, light brown (7.5 YR 6/4), (5,75,20,00, fine to medium grained sand (poorly graded), dense, moist, angular to subangular gravel (<5mm). (Alluvium) (SW) SAND with Gravel, light brown (7.5 YR 6/3), (35,55,10,0), fine to coarse grained sand (well graded), medium dense, wet, angular to subangular well graded gravel (<15mm). (Alluvium) (SM) Silty SAND, light brown (7.5 YR 6/4), (5,75,20,0), fine to medium grained sand (poorly graded), dense, moist, angular to subangular gravel (<5mm). (Alluvium) (ML) SILT, brown (7.5 YR 5/4), (0,15,85,0), medium plasticity, hard, wet, coarse grained sand. (UMCf)	2" Schedule 40 PVC 0.010" Slotted
RKING\\N-S\TU CR TREATABILITY TESTHFIE 00	мс	4-7-9 (16)	Cr VI = 9.5 Dup = 11 Cl04- = 410 Dup = 380		(ML) SILT, brown (7.5 YR 5/4), (0,5,85,10), medium to high plasticity, firm, moist, fine to coarse grained sand. (UMCf) (ML) SILT, brown (7.5YR 5/4), (0,5,70,25), high plasticity, hard, moist, fine to coarse grained sand. (UMCf)	Hydrated Bentonite Chips
PROJECTS\87600014-NERT-M12\WC 25	мс	7-10-13	Cr VI = 6.2 Cl04- = 290		(ML) SILT, brown (7.5YR 5/4), (2,15,83,0), low to medium plasticity, hard, wet, fine to coarse grained sand, subangular to subrounded gravel (<5mm). (UMCf) (ML) SILT, brown (7.5YR 5/4), (0,5,70,25), high plasticity, hard, moist, fine to coarse grained. (UMCf)	
1/10/17 12:47 - NTTS318FS1/CESN	MC	(23)		-	(ML) SILT, light brown (7.5YR 6/4), (5,15,50,20), high plasticity, firm, wet, fine to coarse grained, angular to subangular gravel (<10mm). (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.010" Slotted Screen
ENVIRONMENTAL BH - GINT STD US GDT - 11/10/17 12:47 - \nTTS318FS1 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MC MC	6-9-10 (19)	Cr VI = 13 Cl04- = 1100		(ML) SILT, brown (7.5 YR 5/4),(0,15,70,15), medium plasticity, firm, moist, medium to coarse grained sand. (UMCf)	

BORING NUMBER CTMW-03S

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12

MC 1-30 MC	MC 6-8-9 (17) CIVI = 17 (104-1
MC 4-5-5 (10) (ML) SILT, brown (7.5YR 4/4), (0,5,70,250, high plasticity, firm, moist, fine grained sand. (UMCf) (ML) SILT, brown (7.5YR 4/4), (5,10,75,10), medium plasticity, hard with small cemented nodules, moist, medium to coarse grainedn sand, angular to subangular gravel (<5mm). (UMCf)	MC 4-5-5 (10) MC 4-5-5 (10) (ML) SILT, brown (7.5YR 4/4), (0,5,70,250, high plasticity, firm, moist, fine grained sand. (UMCf) (ML) SILT, brown (7.5YR 4/4), (5,10,75,10), medium plasticity, hard with small cemented nodules, moist, medium to coarse grainedn sand, angular to subangular gravel (<5mm). (UMCf)
plasticity, flart with small certeinted flouries, flicts, medium to coarse grainedn sand, angular to subangular gravel (<5mm). (UMCf) T-9-10 (19) Cr VI = 9.2 Cl04- = 430 (19)	plasticity, hard with small certeined hoddles, most, medium to coarse grainedn sand, angular to subangular gravel (<5mm). (UMCf) Cr VI = 9.2 Cr Old- = 430
	(19)
MC 27-39-40 (79) Cr VI = 1.8 Clo4- = 340 (61.5 ML) SILT, very pale brown (10YR 7/3), (5,10,80,5), low to medium plasticity, hard with small cemented nodules, moist, coarse grained sand, angular to subangular gravel (<5mm). (UMCf)	(ML) SILT, very pale brown (10YR 7/3), (5,10,80,5), low to medium plasticity, hard with small cemented nodules, moist, coarse grained sand, angular to subangular gravel (<5mm). (UMCf)

BORING NUMBER CTMW-04D

PAGE 1 OF 3



CLIE	NT Neva	ıda Environ	mental Resp	onse T	rust (NERT)	PROJECT NAME NE	RT - In-Situ Chromiu	m Treat	ability Study
PRO	JECT NUN	MBER _194	-87600014-1	M12			PROJECT LOCATION	Henderson, NV		
ਰੂ DATE	STARTE	D 3/20/17	<u> </u>	COMI	PLETI	ED 3/22/17	GROUND ELEVATION	_1757 ft H	OLE SIZ	E 12 in
g DRIL	LING CON	NTRACTOR	Cascade I	Orilling			WATER LEVEL AT TIN	ME OF DRILLING 22	.50 ft / E	lev 1734.50 ft
≧ DRIL	LING MET	THOD Holl	ow Stem Au	ger			WATER LEVEL AFTER	R DRILLING 22.62 ft	/ Elev 1	734.38 ft
d LOG	GED BY _	Jeff Riches	on	CHEC	CKED	BY M. Crews				
NOTE	ES Well	completed	with an 18" t	raffic ra	ated v	vell box. Well is co-loca	ted as part of a nested v	vell construction.		
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	ERIAL DESCRIPTION		Casing	WELL DIAGRAM Type: Schedule 40 PVC
UCR TREATABILITY TESTVFIELD PROGRAMBORING C	GB MC	16-20-24	Cr VI < = 0.22 Cl04- = 32 Cr VI < = 0.16		1.0 	(15,75,10,0) (33,33,3 well graded gravel ar (Alluvium) Air knife to 5' bgs (no	AND with Gravel, (15,80 5YR 4/4), dry, medium c	Iry, loose, 1750.0		
7600014-NERT-M12/WORKING/IN-SITI		(44)	C104- = 350			graded gravel and sa subangular to subrou	ind, subangular to round inded gravel, gravel <3".	led sand, (Alluvium)		Neat Cement Grout (5% Bentonite/95% Portland Cement)
1/17 12:47 - NTTS318FS1/CES/PROJECTS/8 1	MC	29-39-50 (89)	Cr VI < = 0.26 Cl04- = 1800			(7.5ÝR 5/4), moist, m sand, subangular to i subrounded gravel, g		ed gravel and ar to		PVC Well Casing
VIRONMENTAL BH - GINT STD US.GDT - 11/10/ 07	MC	17-28-47 (75)	Cr VI = 0.16 Cr VI = 0.16 Cl04- =			(7.5YR 5/4), moist, m	AND, (12,85,3,0) (30,60, nedium dense, well grade ed sand, subangular to s Alluvium)	ed sand,		- Hydrated Bentonite Pellets
6	MC	55	1							[e.]

BORING NUMBER CTMW-04D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

-L					
TREATABILITY LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION WELL DIAGRAM
ਲ 	M^{-}	(54)	3300		(SW) Well Graded SAND, (12,85,3,0) (30,60,10), brown
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - NTTS318FS1/CES/PROJECTS/B7600014-NERT-M12/WORKING/IN-S/TU CR TREATABILITY LOGS.GFU B			Cr VI = 8.1		(7.5YR 5/4), moist, medium dense, well graded sand, subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) (continued) (SW-SM) Well Graded SAND with Silt, (10,80,10,0) (33,33,34), brown (7.5YR 5/4), medium dense, well graded sand, subangular to subrounded gravel and sand, strong cementation, cemented nodules. (Alluvium) (SW) Well Graded SAND. Same as 20-21.5' bgs, except wet between 22.5-23' bgs, moist between 23-24' bgs. (Alluvium)
EATABILITY TESTVFIELD PROC	MC	4-7-7 (14)	Dup = 6.2 Cl04- = 240 Dup = 260		(ML) SILT with Sand, (3,17,78,2) (10,10,80), light brown (7.5YR 6/4), moist, soft to firm, non plastic. (UMCf) (ML) SILT, (0,10,90,0) (0,0,100), light brown (7.5YR 6/4), wet soft to firm, non plastic. (UMCf)
유 -					✓ Hydrated Bentonite Pellets
30			0-1/1 0.0		
ORKING/IN-	мс	10-12-14 (26)	Cr VI = 9.6 Cl04- = 330		(ML) SILT, (0,5,60,35) (0,0,100), strong brown (7.5YR 5/6), moist, firm to stiff, low to medium plasticity. (UMCf)
S/87600014-NERT-M12W					No Recovery.
35 35 SECULIAR STREET	мс	13-20-23 (43)	Cr VI = 11 Cl04- = 480		(ML) SILT, (0,10,75,15) (0,0,100), strong brown (7.5YR 5/6), moist, stiff to very stiff, low plasticity. (UMCf)
2:47 - TTS318FS1/0					(ML) SILT, (0,10,65,25) (0,0,100), strong brown (7.5YR 5/6), wet, low to medium plasticity, clay nodules, stiff to very stiff. (UMCf)
40					(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, stiff, low plasticity, weakly cemented nodules. (UMCf)
A-GINI SID US.GD	МС	7-9-15 (24)	Cr VI = 11 Cl04- = 710		(ML) SILT, (0,10,80,10) (0,10,90), brown (7.5YR 5/3), moist, firm to stiff, low plasticity, very few cemented nodules. (UMCf) #2/16 Sand Filter Pack
ENVIRONMENTAL BH					2" Schedule 40 PVC 0.020" Slotted Screen

BORING NUMBER CTMW-04D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJ HLd3Q 45 50 60			1-87600014-I		PROJECT LOCATION Henderson, NV	V
(H) (#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
-	MC	6-8-17 (25)	Cr VI = 16 Cl04- = 910	-	(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, firm to stiff, low plasticity, few strongly cemented nodules. (UMCf)	
50 _	МС	9-15-16 (31)	Cr VI = 8.1 Cl04- = 450		(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, firm to stiff, low plasticity, few strongly cemented nodules, with strongly cemented nodules 1"- 4" diameter. (UMCf)	
	MC MC	3-8-19 (27)	Cr VI = 11 Cl04- = 830	-	(ML) SILT. Same as above, from 59-60' bgs approximately 30% of interval comprised of moderate to strong cemented nodules. (UMCf)	→ Hydrated Bentonite Chips
60	МС	9-18-55 (73)	Cr VI = 10 Cl04- = 770	6	(ONA) City OAND (5.75.00.0) (40.00.00) have 7.51/D	<u>696.0</u> 695.5

BORING NUMBER CTMW-04S

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV HOLE SIZE 12 in **DATE STARTED** 3/20/17 **COMPLETED** 3/22/17 **GROUND ELEVATION** 1757 ft LOGS.GP. **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.50 ft **TREATABILITY I DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 22.37 ft / Elev 1734.63 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Cr VI < = 0.22 CI04- = 32 (SW-SM) Well Graded SAND with Silt and Gravel, GB 1756.0 (15,75,10,0) (33,33,34), brown (7.5YR 5/4), dry, loose, well graded gravel and sand, subangular to rounded sand. Air knife to 5' bgs (no recovery) 1752.0 5.0 (SW) Well Graded SAND with Gravel, (15,80,5,0) Cr VI < = 0.16 (25,50,25), brown (7.5YR 4/4), dry, medium dense, well 16-20-24 MC C104 - = 350(44)graded gravel and sand, subangular to rounded sand, subangular to subrounded gravel, gravel <3". (Alluvium) **Neat Cement Grout** (5% Bentonite/95% Portland Cement) 10 2" Schedule 40 Cr VI < = (SW) Well Graded SAND, (18,79,3,0) (30,60,10), brown **PVC Well Casing** 0.26 29-39-50 (7.5YR 5/4), moist, medium dense, well graded gravel and MC (89)CI04-= sand, subangular to rounded sand, subangular to 1800 subrounded gravel, gravel <1". (Alluvium) 15 (SW) Well Graded SAND, (12,85,3,0) (30,60,10), brown Cr VI < = 17-28-47 0.2 (7.5YR 5/4), moist, medium dense, well graded sand, МС subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) CI04-= (75)3000 Hydrated Bentonite Pellets 20 Cr VI = 0.16 CI04-= 22-24-30

BORING NUMBER CTMW-04S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

-	PROJ	ECT NUM	IBER <u>194</u>	-87600014-N	И12	PROJECT LOCATION Henderson, NV	
TREATABILITY LOGS.GPJ	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US GDT - 11/10/17 12:47 "NTS318FS1/CES/PROJECTS/87600014/NERT-M/2/WORKING/IN-S/ITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINT/ALL CR TREATABILITY LOGS GFJ	25	мс	4-7-7 (14)	3300 Cr VI = 8.1 Dup = 6.2 Cl04- = 240 Dup = 260		(SW) Well Graded SAND, (12,85,3,0) (30,60,10), brown (7.5YR 5/4), moist, medium dense, well graded sand, subangular to rounded sand, subangular to subrounded gravel, gravel <1". (Alluvium) (continued) (SW-SM) Well Graded SAND with Silt, (10,80,10,0) (33,33,34), brown (7.5YR 5/4), medium dense, well graded sand, subangular to subrounded gravel and sand, strong cementation, cemented nodules. (Alluvium) (SW) Well Graded SAND. Same as 20-21.5' bgs, except wet between 22.5-23' bgs, moist between 23-24' bgs. (Alluvium) (ML) SILT with Sand, (3,17,78,2) (10,10,80), light brown (7.5YR 6/4), moist, soft to firm, non plastic. (UMCf) (ML) SILT, (0,10,90,0) (0,0,100), light brown (7.5YR 6/4), wet soft to firm, non plastic. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
600014-NERT-M12\WORKING\IN-SITU CR TREATA	30	мс	10-12-14 (26)	Cr VI = 9.6 Cl04- = 330		(ML) SILT, (0,5,60,35) (0,0,100), strong brown (7.5YR 5/6), moist, firm to stiff, low to medium plasticity. (UMCf) No Recovery.	
::47 - \\TTS318FS1\\CES\PROJECTS\876	35	мс	13-20-23 (43)	Cr VI = 11 Cl04- = 480		(ML) SILT, (0,10,75,15) (0,0,100), strong brown (7.5YR 5/6), moist, stiff to very stiff, low plasticity. (UMCf) (ML) SILT, (0,10,65,25) (0,0,100), strong brown (7.5YR 5/6), wet, low to medium plasticity, clay nodules, stiff to very stiff. (UMCf)	
IRONMENTAL BH - GINT STD US.GDT - 11/10/17 12	40	мс	7-9-15 (24)	Cr VI = 11 Cl04- = 710		(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), moist, stiff, low plasticity, weakly cemented nodules. (UMCf) (ML) SILT, (0,10,80,10) (0,10,90), brown (7.5YR 5/3), moist, firm to stiff, low plasticity, very few cemented nodules. (UMCf)	2" Schedule 40 PVC 0.020" Slotted Screen

BORING NUMBER CTMW-04S

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \|\TTS318FS1\CESIPROJECTS\87\00014-NERT-M12\WORKING\\N-S\ITU CR TREATABILITY LOGS\GR\GNINTALL CR TRAATABILITY L ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Cr VI = 16 (ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), CI04- = 910 moist, firm to stiff, low plasticity, few strongly cemented 6-8-17 MC nodules. (UMCf) (25)50 Cr VI = 8.1 (ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), 9-15-16 C104 - = 450moist, firm to stiff, low plasticity, few strongly cemented MC nodules, with strongly cemented nodules 1"- 4" diameter. (31)(UMCf) 55 Cr VI = 11 (ML) SILT. Same as above, from 59-60' bgs approximately 3-8-19 C104 - = 83030% of interval comprised of moderate to strong MC ■Hydrated Bentonite cemented nodules. (UMCf) (27)Chips 60 Cr VI = 10 (ML) SILT. Same as above with approximately 30% 9-18-55 CI04 - = 770comprised of moderate cementation. (UMCf) MC 61.0 1696.0 (73)(SM) Silty SAND, (5,75,20,0) (10,60,30), brown (7.5YR) 61.5 1695.5 4/4), moist, medium dense to dense, subangular to rounded sand, well graded sand, subangular to subrounded gravel, gravel <0.5", very small weakly cemented nodules throughout. (UMCf) Bottom of borehole at 61.5 feet.

BORING NUMBER CTMW-05D

PAGE 1 OF 3



CLIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - In-Situ Chromium Treatability Study **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV **DATE STARTED** 6/5/17 COMPLETED 6/5/17 HOLE SIZE 12 in **GROUND ELEVATION** 1757.25 ft TREATABILITY LOGS.GP. DRILLING CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.75 ft **DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 23.36 ft / Elev 1733.89 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH € MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC (SM) Silty SAND, (20,60,20,0) (30,60,10), pale brown (10YR 6/3), dry, dense, well graded gravel and sand, gravel <2" Subangular to Subrounded (SA/SR). (Alluvium) 12-16-26 MC (42)(SM) Silty SAND, (10,70,20,0) (30,40,30), light yellowish brown (10YR 6/4), fine to coarse grained sand, moist, 20-43-50 MC moderate cementation from 8-9' below ground surface (93)(bgs), dense, gravel <1" SA/SR. (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 10.0 1747.3 2" Schedule 40 (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark **PVC Well Casing** yellowish brown (10YR 4/4), fine to coarse grained sand, 23-29-39 MC (68)moist, medium dense, gravel <2.5" SA/SR. (Alluvium) 15 16-27-31 MC (58)Hydrated Bentonite 17.5 1739.8 Chips (SP) Poorly-Graded SAND, (10,80,10,0) (10,40,50), dark yellowish brown (10YR 4/4), fine to medium grained sand, 18.5 1738.8 moist, medium dense, gravel <0.5" SA/SR. (Alluvium) (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, moist, medium dense, gravel <2.5" SA/SR. (Alluvium) 20 10-50

BORING NUMBER CTMW-05D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

IREATABILITY LOGS.GF DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM					
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - N.TTS318FS1/CES/PROJECTS\0.87600014-NERT-M12/WORKING\0.NEST-FIELD PROGRAM\0.08177 12:47 - N.TTS318FS1/CES\0.08177 12:47 - N.TTS318FS1/CE	MC	1-1-2 (3)			(SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, moist, medium dense, gravel <2.5" SA/SR. (Alluvium) ✓ (continued) (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, wet, medium dense, gravel <2.5" SA/SR. (Alluvium) (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, moist, dense, strong cementation, gravel <2.5" SA/SR. (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), firm, wet, some cemented nodules, low plasticity. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen					
00014.NERT-M12WORKINGNIN-SITU CR TREA	мс	2-5-10 (15)			No Recovery 30-35' bgs.	→ Hydrated Bentonite Chips					
7 12.47 - WTTS318FS1/CES/PROJECTS/876	МС	15-17-18 (35)			35.0 (ML) SILT, (0,10,90,0) (0,0,100), yellowish brown (10YR 5/4), stiff, wet, contains ~15% cemented nodules (between 35-37' bgs), low plasticity. (UMCf)	3					
/IRONMENTAL BH - GINT STD US,GDT - 11/10/1	MC	2-2-8 (10)			(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval, large 3" cemented nodule @ 43.5' bgs. (UMCf)	##2/16 Sand Filter Pack					

BORING NUMBER CTMW-05D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

TREATABILITY LOGS.GP. DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
RAM/BORING LOGS/GINTALL CR	мс	2-2-3 (5)			(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval. (UMCf)	2" Schedule 40 PVC 0.020" Slotted Screen
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \ TTS318FS1/GESIPROJECTS\\\87600014-NERT-M12WORKING\\NING\NIN	мс	8-7-6 (13)			(ML) SILT, (0.10.80.10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low to medium plasticity, small <0.5" cemented nodules present throughout interval. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval. (UMCf)	
0014-NERT-M12WORKINGWN-SITU (мс	3-7-8 (15)				
S318FS1/0ES/PROJECTS/876(МС	6-7-10 (17)		6	(ML) SILT, (0,0,85,15) (0,0,100), pale brown (10YR 6/3), stiff, wet, ~15% of sample comprised of cemented nodules, low to medium plasticity. (UMCf)	◄ Hydrated Bentonite Pellets 5.8
	<i>[</i>			6	Bottom of borehole at 61.5 feet.	5.8
20.00						
NVIKCNIMENTAL DII - GIIN						

BORING NUMBER CTMW-05S

PAGE 1 OF 3



CLIEN	NT Neva	da Environr	mental Res	ponse T	rust (NERT)	PROJECT NAME NERT - In-Situ Chromium Treatability Study							
PROJ	ECT NUM	IBER 194-	87600014-	-M12		PROJECT LOCATION Henderson,	NV						
B DATE	STARTE	D 6/5/17		COMF	PLETED 6/5/17	GROUND ELEVATION 1757.24 ft	нс	LE SIZ	E 12 in				
g DRILL	ING CON	ITRACTOR	Cascade	Drilling		WATER LEVEL AT TIME OF DRILLI	ING 22.5	0 ft / El	ev 1734.74 ft				
≟ DRILL	ING MET	HOD Holle	ow Stem A	uger		WATER LEVEL AFTER DRILLING 2	23.18 ft /	Elev 17	34.06 ft				
LOGG	SED BY	Jeff Riches	on	CHEC	KED BY M. Crews								
∃l				traffic ra	ted well box. Well is co-locat	ted as part of a nested well constructi	ion.						
<u> </u>			7										
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC					
NOW NOW N						,60,20,0) (30,60,10), pale brown		9 8	Ä				
REA I ABILITY TESTIVELD PROGRAMBORING LO	MC	12-16-26 (42)			(10YR 6/3), dry, dens gravel <2" Subangula	e, well graded gravel and sand, ir to Subrounded (SA/SR). (Alluvium)							
Si87600014-NERT-MT2WORKINGsIN-SITU CR TREATABILITY	мс	20-43-50 (93)			brown (10YR 6/4), fin moderate cementatio (bgs), dense, gravel <	,70,20,0) (30,40,30), light yellowish e to coarse grained sand, moist, n from 8-9' below ground surface <1" SA/SR. (Alluvium)	1747.2		Neat Cement Grout (5% Bentonite/95% Portland Cement)				
7/10/17 12:47 - 1/11 531 8F 51/CESIPROJECT 5/8/87	MC	23-29-39 (68)			yellowish brown (10Y	AND, (10,80,10,0) (33,33,34), dark R 4/4), fine to coarse grained sand, , gravel <2.5" SA/SR. (Alluvium)			PVC Well Casing				
ENVIRONMENTAL BLOOK CODI	MC MC	(58)			(SP) Poorly-Graded Syellowish brown (10Y moist, medium dense (SW) Well-Graded Syellowish brown (10Y	SAND, (10,80,10,0) (10,40,50), dark R 4/4), fine to medium grained sand, s, gravel <0.5" SA/SR. (Alluvium) AND, (10,80,10,0) (33,33,34), dark R 4/4), fine to coarse grained sand, s, gravel <2.5" SA/SR. (Alluvium)	<u>1739.7</u> _ <u>1738.7</u>		← Hydrated Bentonite Chips				

BORING NUMBER CTMW-05S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	V	WELL DIAGRAM					
	MC	1-1-2			(SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, moist, medium dense, gravel <2.5" SA/SR. (Alluvium) ✓ (continued) (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, wet, medium dense, gravel <2.5" SA/SR. (Alluvium) (SW) Well-Graded SAND, (10,80,10,0) (33,33,34), dark yellowish brown (10YR 4/4), fine to coarse grained sand, moist, dense, strong cementation, gravel <2.5" SA/SR. (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), firm, wet, some cemented nodules, low plasticity. (UMCf)	2	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen					
30	МС	2-5-10 (15)			No Recovery 30-35' bgs.		→ Hydrated Bentonite Chips					
35	мс	15-17-18 (35)			35.0 (ML) SILT, (0,10,90,0) (0,0,100), yellowish brown (10YR 5/4), stiff, wet, contains ~15% cemented nodules (between 35-37' bgs), low plasticity. (UMCf)	22						
40	МС	2-2-8 (10)			(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval, large 3" cemented nodule @ 43.5' bgs. (UMCf)							
 45							#2/16 Sand Filter Pack					

BORING NUMBER CTMW-05S

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

PEATABILITY LOGS.GPJ	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
THE CK	мс	2-2-3 (5)			(ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval. (UMCf)	2" Schedule 40 PVC 0.020" Slotted Screen
ENVIRONMENTAL BH - GINT S ID US, GDT - 17/10/17 12.47 - 11/10/17 12.47 - 1	мс	8-7-6 (13)			(ML) SILT, (0.10.80.10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low to medium plasticity, small <0.5" cemented nodules present throughout interval. (UMCf) (ML) SILT, (0,10,80,10) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval. (UMCf)	
255	мс	3-7-8 (15)				
1953 1875 1975	мс	6-7-10 (17)		6	(ML) SILT, (0,0,85,15) (0,0,100), pale brown (10YR 6/3), stiff, wet, ~15% of sample comprised of cemented nodules, low to medium plasticity. (UMCf)	◄ Hydrated Bentonite Pellets 5.7
	МС	6-7-10 (17)		6	Bottom of borehole at 61.5 feet.	5.7

BORING NUMBER CTMW-06D

PAGE 1 OF 3



	CLIEN	T Neva	da Environr	mental Res	ponse T	rust (NERT)	PROJECT NAME NERT - In-Situ Chromium Treatability Study							
	PROJI	ECT NUM	IBER <u>194</u> -	-87600014-	M12		PROJECT LOCATION _	Henderson, NV						
GPJ	DATE	STARTE	D <u>6/6/17</u>		COME	PLETED _6/6/17	GROUND ELEVATION	1757.42 ft	HOLE SIZ	E <u>12 in</u>				
SSO	DRILL	ING CON	ITRACTOR	Cascade	Drilling		WATER LEVEL AT TIME	E OF DRILLING 2	22.50 ft / El	ev 1734.92 ft				
	DRILL	ING MET	HOD Holle	ow Stem A	uger		WATER LEVEL AFTER DRILLING 23.74 ft / Elev 1733.68 ft							
ABIL	LOGG	ED BY	Jeff Riches	on	CHEC	CKED BY M. Crews								
PROJECT NUMBER 194-87600014-M12 PROJECT LOCATION Henderson, NV DATE STARTED 6/6/17 COMPLETED 6/6/17 GROUND ELEVATION 1757.42 ft HO DRILLING CONTRACTOR Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.5 DRILLING METHOD Hollow Stem Auger WATER LEVEL AFTER DRILLING 23.74 ft / LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. MATERIAL DESCRIPTION MATERIAL DESCRIPTION														
CR.		111												
ING LOGS/GINT/ALL		SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENT. DATA	GRAPHIC LOG	МАТЕ	ERIAL DESCRIPTION			WELL DIAGRAM Type: Schedule 40 PVC				
N BOR	U			ш						,,				
ATABILITY TEST/FIELD PROGRAM	 	МС				(10YR 6/3), dry, dens gravel, subangular to	se, well graded gravel and subrounded <3" SA/SR.	d sand, (Alluvium)						
114-NERT-M12/WORKING/IN-SITO OR TREA	5	МС				brown (10YR 6/4), fir moderate cementation	ne to coarse grained sand on between 7-9' below gro	l, moist,	X	Neat Cement Grout (5% Bentonite/95% Portland Cement)				
WITS318FS1/CES/PROJECTS/8/6000	10	МС				(SW) Well-Graded S yellowish brown (10\) and gravel, medium	'R 4/4), fine to coarse gra	,33), dark ined sand	7.4	2" Schedule 40 PVC Well Casing				
3H - GINT STD US.GDT - 11/10/17 12:47 -	15	мс				yellowish brown (10)	'R 4/4), dense, moist, gra	vel <2"		← Hydrated Bentonite Chips				
ENVIRONMENTAL E	20	мс	15-44-50											

BORING NUMBER CTMW-06D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

REATABILITY LOGS.GPJ DEPTH	(ft) SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
VCESIPROJECTS/87600014-NERT-M12WORKING/IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTVALL CR TREATABILITY LOGS.GPJ	5 MC	(94) 1-2-2 (4)			(SW) Well-Graded SAND, (15,70,10,0) (30,40,30) dark yellowish brown (10YR 4/4), dense, moist, gravel <2" SA/SR, fine to coarse grained sand. (Alluvium) (continued) (SW) Well-Graded SAND, (15,70,10,0) (30,40,30)), dark yellowish brown (10YR 4/4), dense, wet, gravel <2" SA/SR, fine to coarse grained sand. (Alluvium) (SW) Well-Graded SAND, (15,70,10,0) (30,40,30), dark yellowish brown (10YR 4/4), dense, moist, gravel <2" SA/SR, fine to coarse grained sand, moderate cementation. (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), stiff, moderate cementation, non plastic. (UMCf) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), firm, wet, non plastic. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
-NERT-M12/WORKING/IN-SITU CR TREATAE	0 MC	3-6-9 (15)			(ML) SILT, (0,10,90,0) (0,0,100), light brown (7.5 YR 6/4), firm, wet, some small <0.5" cemented nodules, non plastic. (UMCf)	
2:47 - NTTS318FS1\CES\PROJECTS\87600014	5 MC	17-19-20 (39)			(ML) SILT, (0,10,90,0) (0,0,100), yellowish brown (10YR 5/4), stiff, wet, contains ~5% cemented nodules throughout interval, low plasticity. (UMCf)	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:47 - \\TTS318FS1	0 MC	3-4-9 (13)			(ML) SILT, (0,10,80,10) (0,0,100), yellowish brown (7.5YR 5/4), wet, stiff, small <0.5" cemented nodules throughout interval, low plasticity. (UMCf)	
ENVIRC 4	5				(Continued Next Page)	

BORING NUMBER CTMW-06D

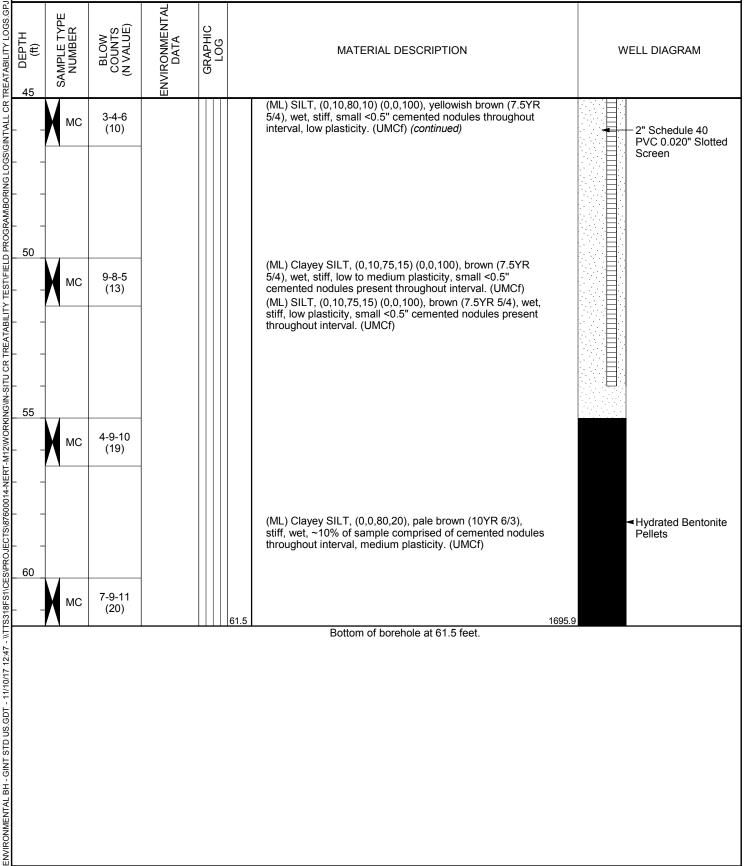
PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER 194-87600014-M12 **PROJECT NUMBER** 194-87600014-M12



BORING NUMBER CTMW-06S

PAGE 1 OF 3



PROJECT NAME NERT - In-Situ Chromium Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600014-M12 PROJECT LOCATION Henderson, NV **DATE STARTED** 6/6/17 COMPLETED 6/6/17 HOLE SIZE 12 in TREATABILITY LOGS.GP. **GROUND ELEVATION** 1757.43 ft **DRILLING CONTRACTOR** Cascade Drilling WATER LEVEL AT TIME OF DRILLING 22.50 ft / Elev 1734.93 ft **DRILLING METHOD** Hollow Stem Auger WATER LEVEL AFTER DRILLING 23.41 ft / Elev 1734.02 ft LOGGED BY Jeff Richeson CHECKED BY M. Crews NOTES Well completed with an 18" traffic rated well box. Well is co-located as part of a nested well construction. ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12.47 - "ITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL CR ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC (SM) Silty SAND, (20,60,20,0) (30,50,20), pale brown (10YR 6/3), dry, dense, well graded gravel and sand, gravel, subangular to subrounded <3" SA/SR. (Alluvium) 14-17-28 MC (45)(SM) Silty SAND, (0,70,20,0) (30,40,30), light yellowish brown (10YR 6/4), fine to coarse grained sand, moist, 19-45-50 MC moderate cementation between 7-9' below ground surface (95)(bgs), dense, gravel <2" SA/SR. (Alluvium) Neat Cement Grout (5% Bentonite/95% Portland Cement) 10 10.0 1747.4 2" Schedule 40 (SW) Well-Graded SAND, (10,75,15,0) (33,34,33), dark **PVC Well Casing** yellowish brown (10YR 4/4), fine to coarse grained sand 22-31-40 MC (71)and gravel, medium dense, moist, gravel <2.5" SA/SR. (Alluvium) 15 (SW) Well-Graded SAND, (15,70,10,0) (30,40,30) dark yellowish brown (10YR 4/4), dense, moist, gravel <2" 19-30-35 MC SA/SR, fine to coarse grained sand. (Alluvium) (65)Hydrated Bentonite Chips 20 15-44-50

BORING NUMBER CTMW-06S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 25 	MC	(94) 1-2-2 (4)		24.0	(SW) Well-Graded SAND, (15,70,10,0) (30,40,30) dark yellowish brown (10YR 4/4), dense, moist, gravel <2" SA/SR, fine to coarse grained sand. (Alluvium) (continued) (SW) Well-Graded SAND, (15,70,10,0) (30,40,30)), dark yellowish brown (10YR 4/4), dense, wet, gravel <2" SA/SR, fine to coarse grained sand. (Alluvium) (SW) Well-Graded SAND, (15,70,10,0) (30,40,30), dark yellowish brown (10YR 4/4), dense, moist, gravel <2" SA/SR, fine to coarse grained sand, moderate cementation. (Alluvium) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), stiff, moderate cementation, non plastic. (UMCf) (ML) SILT, (0,10,80,10) (0,10,90), light brown (7.5YR 6/4), firm, wet, non plastic. (UMCf)	#2/16 Sand Filter Pack 2" Schedule 40 PVC 0.020" Slotted Screen
30	мс	3-6-9 (15)			(ML) SILT, (0,10,90,0) (0,0,100), light brown (7.5 YR 6/4), firm, wet, some small <0.5" cemented nodules, non plastic. (UMCf)	→ Hydrated Bentonite Pellets
35	мс	17-19-20 (39)			(ML) SILT, (0,10,90,0) (0,0,100), yellowish brown (10YR 5/4), stiff, wet, contains ~5% cemented nodules throughout interval, low plasticity. (UMCf)	
40	MC	3-4-9 (13)			(ML) SILT, (0,10,80,10) (0,0,100), yellowish brown (7.5YR 5/4), wet, stiff, small <0.5" cemented nodules throughout interval, low plasticity. (UMCf)	
- 45						

BORING NUMBER CTMW-06S

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - In-Situ Chromium Treatability Study

PROJECT NUMBER <u>194-87600014-M12</u>

(JJ) 5	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM			
	MC	3-4-6 (10)			(ML) SILT, (0,10,80,10) (0,0,100), yellowish brown (7.5YR 5/4), wet, stiff, small <0.5" cemented nodules throughout interval, low plasticity. (UMCf) (continued)	2" Schedule 40 PVC 0.020" Slotted Screen			
_ 50 _	MC	9-8-5 (13)			(ML) Clayey SILT, (0,10,75,15) (0,0,100), brown (7.5YR 5/4), wet, stiff, low to medium plasticity, small <0.5" cemented nodules present throughout interval. (UMCf) (ML) SILT, (0,10,75,15) (0,0,100), brown (7.5YR 5/4), wet, stiff, low plasticity, small <0.5" cemented nodules present throughout interval. (UMCf)				
(#) H1d30 45 50 55 60	мс	4-9-10 (19)			(ML) Clayey SILT, (0,0,80,20), pale brown (10YR 6/3), stiff, wet, ~10% of sample comprised of cemented nodules throughout interval, medium plasticity. (UMCf)	→ Hydrated Bentonite Pellets			
60	MC	7-9-11 (20)		6	1695. Bottom of borehole at 61.5 feet.	9			

Chemical Reduction Study

Table B-2 - Well Construction DetailsAP Area

Well ID	Northing (feet)	Easting (feet)	Latitude	Longitude	Borehole Size (inches)	Well Diameter (inches)	Well Material (blank casing)	Well Vault	Filter Pack Material	Screen Material	Screen Interval (feet bgs)	Screen Top (feet bgs)	Screen Bottom (feet bgs)	Screen Interval (feet btoc)	Screen Top (feet btoc)	Screen Bottom (feet btoc)	Screen Length (feet)	Total Depth of Borehole (feet bgs)	TOC Elevation (feet amsl)	Ground Surface Elevation (feet amsl)
UFIW-01S	26719540.562	827314.237	36.04782° N	115.00433° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	23 - 28	23	28	22.7 - 27.7	22.70	27.70	5	28.1	1,755.11	1,755.41
UFIW-01I	26719541.816	827319.017	36.04782° N	115.00431° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	33 - 38	33	38	32.6 - 37.6	32.6	37.6	5	38.1	1,755.08	1,755.51
UFIW-01D	26719542.292	827324.566	36.04781° N	115.00432° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	43 - 48	43	48	42.7 - 47.7	42.7	47.7	5	61.5	1,755.21	1,755.55
UFIW-02S	26719536.782	827342.924	36.04782° N	115.00426° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	23 - 28	23	28	22.6 - 27.6	22.6	27.6	5	28.1	1,754.97	1,755.41
UFIW-02I	26719537.024	827346.383	36.04782° N	115.00425° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	31 - 41	31	41	30.5 - 40.5	30.5	40.5	10	41.1	1,754.85	1,755.39
UFIW-02D	26719533.321	827344.214	36.04781° N	115.00426° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	43 - 48	43	48	42.6 - 47.6	42.6	47.6	5	61.5	1,755.01	1,755.45
UFIW-03S	26719537.055	827360.668	36.04782° N	115.00420° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	25 - 30	25	30	24.7 - 29.7	24.7	29.7	5	35.0	1,755.22	1,755.55
UFIW-03I	26719537.079	827364.669	36.04782° N	115.00419° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	35 - 40	35	40	34.2 - 39.2	34.2	39.2	5	40.0	1,754.89	1,755.67
UFIW-03D	26719533.833	827362.838	36.04781° N	115.00420° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	45 - 50	45	50	44.7 - 49.7	44.7	49.7	5	61.5	1,755.38	1,755.71
UFIW-04S	26719537.499	827378.974	36.04782° N	115.00414° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	23 - 28	23	28	22.5 - 27.5	22.5	27.5	5	28.0	1,755.28	1,755.80
UFIW-04I	26719536.893	827382.838	36.04782° N	115.00413° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	33 - 38	33	38	32.5 - 37.5	32.5	37.5	5	38.0	1,755.33	1,755.83
UFIW-04D	26719533.460	827380.800	36.04781° N	115.00414° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	43 - 48	43	48	42.5 - 47.5	42.5	47.5	5	61.5	1,755.39	1,755.90
UFIW-05S	26719356.906	827324.545	36.04733° N	115.00433° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	24.5 - 29.5	24.5	29.5	24.0 - 29.0	24.0	29.0	5	30.0	1,759.63	1,760.11
UFIW-05I	26719358.197	827328.233	36.04733° N	115.00432° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	34.5 - 39.5	34.5	39.5	34.1 - 39.1	34.1	39.1	5	40.0	1,759.71	1,760.11
UFIW-05D	26719353.491	827326.739	36.04732° N	115.00432° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	44.5 - 49.5	44.5	49.5	44.1 - 49.1	44.1	49.1	5	61.5	1,759.78	1,760.18
UFIW-06S	26719356.818	827342.877	36.04733° N	115.00427° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	27 - 32	27	32	26.7 - 31.7	26.7	31.7	5	32.0	1,759.76	1,760.10
UFIW-06I	26719356.987	827346.786	36.04733° N	115.00425° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	35 - 45	35	45	34.6 - 44.6	34.6	44.6	10	45.0	1,759.71	1,760.10
UFIW-06D	26719353.775	827344.375	36.04732° N	115.00426° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	47 - 52	47	52	46.6 - 51.6	46.6	51.6	5	61.5	1,759.85	1,760.24
UFIW-07S	26719357.178	827360.466	36.04733° N	115.00421° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	26 - 31	26	31	25.6 - 30.6	25.6	30.6	5	31.0	1,759.76	1,760.14
UFIW-07I	26719357.283	827364.425	36.04733° N	115.00419° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	36 - 41	36	41	35.6 - 40.6	35.6	40.6	5	41.4	1,759.63	1,760.05
UFIW-07D	26719353.909	827362.364	36.04732° N	115.00420° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	46 - 51	46	51	45.7 - 50.7	45.7	50.7	5	61.5	1,759.79	1,760.10
UFIW-08S	26719357.073	827378.270	36.04733° N	115.00415° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	25 - 30	25	30	24.6 - 29.6	24.6	29.6	5	30.0	1,759.60	1,759.99
UFIW-08I	26719357.398	827382.269	36.04733° N	115.00413° W	8	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	35 - 40	35	40	34.6 - 39.6	34.6	39.6	5	40.1	1,759.61	1,760.03
UFIW-08D	26719353.422	827380.664	36.04732° N	115.00414° W	8	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	45 - 50	45	50	44.6 - 49.6	44.6	49.6	5	61.5	1,759.77	1,760.19
UFMW-01S	26719557.741	827322.226	36.04788° N	115.00432° W	12	2	Sch. 40 PVC	0.000	#3 Monterey Sand	2-in PVC 0.020"	24 - 29	24	29	23.6 - 28.6	23.6	28.6	5		1,755.07	1,755.49
UFMW-01I	26719557.863	827322.690	36.04788° N	115.00432° W	12	2	Sch. 40 PVC	2 ft x 2 ft Square	#3 Monterey Sand	2-in PVC 0.020"	34 - 39	34	39	33.5 - 38.5	33.5	38.5	5	61.5	1,755.03	1,755.49
UFMW-01D	26719558.151	827322.333	36.04788° N	115.00432° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	44 - 49	44	49	43.6 - 48.6	43.6	48.6	5		1,755.12	1,755.49
UFMW-02S	26719562.049	827348.779	36.04788° N	115.00424° W	12	2	Sch. 40 PVC	2 ft x 2 ft Square	#3 Monterey Sand	2-in PVC 0.020"	24 - 29	24	29	23.6 - 28.6	23.6	28.6	5	61.5	1,755.02	1,755.42
UFMW-02I UFMW-02D	26719562.257 26719562.018	827348.705 827348.509	36.04788° N 36.04788° N	115.00424° W 115.00424° W	12 12	2	Sch. 40 PVC Sch. 40 PVC	Z II X Z II Square	#3 Monterey Sand #3 Monterey Sand	2-in PVC 0.020" 2-in PVC 0.020"	34 - 39 44 - 49	34 44	39 49	33.6 - 38.6 43.6 - 48.6	33.6 43.6	38.6 48.6	5 5	01.5	1,755.05 1.755.02	1,755.42 1.755.42
UFMW-02D	26719552.018	827375.383	36.04788° N	115.00424° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	21 - 26	21	26	20.3 - 25.3	20.3	25.3	5 5	+	1,755.02	1,755.37
UFMW-035	26719554.071	827375.068	36.04788° N	115.00417 W	12	2	Sch. 40 PVC	2 ft x 2 ft Square	#3 Monterey Sand	2-in PVC 0.020"	30 - 40	30	40	29.3 - 39.3	29.3	39.3	10	61.5	1,754.70	1,755.37
UFMW-03D	26719554.600	827375.336	36.04788° N	115.00417 W	12	2	Sch. 40 PVC	Z II X Z II Oquale	#3 Monterey Sand	2-in PVC 0.020"	45 - 50	45	50	44.4 - 49.4	44.4	49.4	5	- 01.5	1,754.77	1,755.37
UFMW-04S	26719383.022	827323.589	36.04740° N	115.00417 W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	24 - 29	24	29	23.8 - 28.8	23.8	28.8	5	1	1,754.77	1,759.03
UFMW-041	26719383.413	827323.445	36.04740° N	115.00433° W	12	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	34 - 39	34	39	33.8 - 38.8	33.8	38.8	5	61.5	1,758.84	1,759.03
UFMW-04D	26719383.319	827323.878	36.04740° N	115.00433° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	44 - 49	44	49	43.8 - 48.8	43.8	48.8	5	┪	1,758.83	1,759.03
UFMW-05S	26719382.716	827353.392	36.04740° N	115.00423° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	25 - 30	25	30	24.7 - 29.7	24.7	29.7	5	1	1,758.94	1,759.26
UFMW-05I	26719382.708	827353.377	36.04740° N	115.00423° W	12	2	Sch. 40 PVC	18-in Diameter Round #	#3 Monterey Sand	2-in PVC 0.020"	35 - 40	35	40	34.7 - 39.7	34.7	39.7	5	61.5	1,758.92	1,759.26
UFMW-05D	26719382.960	827353.791	36.04740° N	115.00423° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	45 - 50	45	50	44.6 - 49.6	44.6	49.6	5		1,758.91	1,759.26
UFMW-06S	26719383.527	827382.753	36.04740° N	115.00413° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	25 - 30	25	30	24.5 - 29.5	24.5	29.5	5	İ	1,758.74	1,759.25
UFMW-06I	26719383.348	827383.091	36.04740° N	115.00413° W	12	2	Sch. 40 PVC	18-in Diameter Round	#3 Monterey Sand	2-in PVC 0.020"	35 - 40	35	40	34.5 - 39.5	34.5	39.5	5	61.5	1,758.71	1,759.25
UFMW-06D	26719383.109	827382.807	36.04740° N	115.00413° W	12	2	Sch. 40 PVC		#3 Monterey Sand	2-in PVC 0.020"	45 - 50	45	50	44.5 - 49.5	44.5	49.5	5		1,758.76	1,759.25

Notes:

amsl Above mean sea level
bgs Below ground surface
btoc Below top of casing
ft Feet
in Inches
PVC Polyvinyl Chloride

Sch. Schedule
TOC Top of Casing



BORING NUMBER UFIW-01S

PAGE 1 OF 2

	TŁ	TETRA TECH, INC.
ı		

	OL IEN	LIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - AP Area Treatability Study											
				tability Stud	dy								
				-87600012-			PROJECT LOCATION _		HOLE SIZE	= 8 in			
								UND ELEVATION 1755.11 ft HOLE SIZE 8 in					
		LING CONTRACTOR National EWP WATER LEVEL AT TIME OF DRILLING LING METHOD Hollow Stem Auger WATER LEVEL AFTER DRILLING 27.6											
<u> </u>		LING METHOD Hollow Stem Auger WATER LEVEL AFTER DRILLING WATER DRILLING WAT						DRILLING 27.03	IL/ Elev I/	27.40 IL			
999		· -				ated well box.							
7 IS													
GS/GIN I VALL I	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION			WELL DIAGRAM				
200	•	SAI		=									
I REA I ABILITY TEST (FIELD PROGRAM/BORIN	5					(SM) Silty SAND, very fine to coarse sand, lo coarse gravel.	pale brown (10YR 8/3), ose, dry, well graded, lit	15/70/15/0, tle fine to	Casing T	ype: Schedule 40 PVC			
5								4= 40					
J014-NEKI-M1ZWORKING\\N-SIT\						Moderate to strong cei	mentation 6' to 10'.	1749		■Bentonite grout.			
CES/PROJECTS/8/60	10					(SM) Silty SAND, brown (7.9) medium sand, medium graded, little fine grave	5YR 5/4), 10/70/20/0, fin n dense to very dense, n el.	<u>1745</u> ne to noist, well	2.1				
GDI - 11/10/17 12:49 - 1110510F51	 _ 15 _					Silty SAND, brown (7.9 sand, medium dense,	5YR 5/4), 0/80/20/0, fine moist, well graded.	to medium		2" Schedule 40 PVC blank casing.			
ENVIRONMENTAL BH - GINT STD US:						Silty SAND, brown (7.5 medium sand, loose to	5YR 5/4), 10/70/20/0, fin o medium dense, moist,	e to well graded,		■ Hydrated bentonite chip seal.			

BORING NUMBER UFIW-01S PAGE 2 OF 2



TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ DEPTH (ff)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\N-SITU CR TREATABILITY TEST\FIELD PROGRAMBORING LOGS\GINTALL M13 LOGS\GPJ DE					Silty SAND, brown (7.5YR 5/4), 10/70/20/0, fine to medium sand, medium dense, moist, well graded, little fine gravel. (ML) Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, moist. Bottom of borehole at 28.1 feet.	2" Schedule 40 PVC 0.020" slotted screen.
ESIPROJECTS\87600014-NERT-M12\WORKING\\N-SITU						
MENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\\						

BORING NUMBER UFIW-01I



CLIEN	IT Neva	da Environi	mental Resp	ponse	Trust	(NERT)	PROJECT NAME NER	T - AP Area	Treatab	ility Stuc	ly
PROJ	ECT NUM	IBER 194	-87600012-	M13			PROJECT LOCATION _	Henderson,	NV		
DATE	STARTE	D _7/13/16		COM	IPLET	ED 7/21/16	GROUND ELEVATION	1755.08 ft	нс	DLE SIZE	8 in
DRILL	ING CON	ITRACTOR	National E	EWP			WATER LEVEL AT TIME	OF DRILLII	NG 32.0	00 ft / Ele	ev 1723.08 ft
DRILL	ING MET	HOD Holl	ow Stem Au	uger			WATER LEVEL AFTER	DRILLING 2	7.54 ft /	Elev 17	27.54 ft
? !						BY M. Crews					
			with an 18" t								
			7								
HT (SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG							
DEPTH (ft)	1PLE IUME	BLC SOUN	SON	LS RA		MATE	RIAL DESCRIPTION			'	WELL DIAGRAM
	SAN	02	M	9							
0			Ш			(SM) Silty SAND, ver	y pale brown (10YR 8/4),	15/70/15/0		Casing Ty	ype: Schedule 40 PVC
						fine to coarse sand, I	oose, dry, well graded, litt	le fine to			× × × × × × × × × × × × × × × × × × ×
						coarse gravel, concre	ete and asphalt debris pre	sent.			
										X X	
:[]											
5_										X X	
					5.5	Madarata ta atrana a	amontation E El to 10'		1749.6		
<u>-</u>						woderate to strong c	ementation 5.5' to 10'.				
-											
-											
10					10.0				<u>1745</u> .1		
						(SM) Silty SAND with gray	el, light brown (7.5YR 6/3)			
<u> </u>						20/65/15/0, fine to co	arse sand, fine to coarse	gravel,			
						moist, well graded.					
<u> </u>											
											■Bentonite grout.
									K		Oll Cabadula 40
)	2" Schedule 40 PVC blank casing.
15											3.
						Silty SAND with grav	el, light brown (7.5YR 6/3) arse sand, fine to coarse), aravel	k		
						moist, well graded.	arse sariu, iirie to coarse	yıav e i,			
3											
<u> </u>											
										X X	
-											
20									\$		
						Silty SAND with grav	el, light brown (7.5YR 6/3),			
i						∠0/05/15/0, fine to co	arse sand, fine to coarse	gravei,			2

BORING NUMBER UFIW-01I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
25			_		moist, well graded. (SM) (continued) Silty SAND with gravel, light brown (7.5YR 6/3), 20/65/15/0, fine to coarse sand, fine to coarse gravel,	
30					moist, well graded. 28.0 (ML) Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low plasticity, fine to medium sand, hard, moist. Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low plasticity, fine to medium sand, hard, moist.	1 ► Hydrated bentonite chip seal.
30 30 35					Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low plasticity, fine to medium sand, hard, wet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
	,				38.1 Bottom of borehole at 38.1 feet.	0

BORING NUMBER UFIW-01D



	CLIEN	T Neva	da Environr	mental Res	oonse '	Trust (NERT)	PROJECT NAME NERT - AP Area Treat	ability Study		
F	PROJE	ECT NUM	IBER 194-	-87600012-	M13		PROJECT LOCATION Henderson, NV			
	DATE	STARTE	D _7/13/16		COM	PLETED _7/20/16	GROUND ELEVATION _1755.21 ft	HOLE SIZE 8 in		
	DRILL	ING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME OF DRILLING 32.00 ft / Elev 1723.21 ft			
	DRILL	ING MET	HOD Holle	ow Stem Au	ıger		WATER LEVEL AFTER DRILLING 20.37	ft / Flev 1734 84 ft		
	OGG	ED BY	Eric Peirce		CHE	CKED BY M. Crews	<u>=0.0.</u>			
ι						ated well box.				
113 -										
GLOGS/GINT/ALL N	, DEPIH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	WELL DIAGRAM			
	0			Ш		(SM)		Casing Type: Schedule 40 PVC		
IU CR TREATABILITY TESTAFIELD PROGRAM/BORING LO	5					Silty SAND with Grav 20/65/15/0, fine to co loose, dry, well grade Silty SAND with Grav 20/65/15/0, fine to co	vel, light yellowish brown (10YR 6/4), parse sand, fine to coarse gravel,			
<u> </u>	-					loose, dry, well grade	ed, few cemented fragments.	7		
NG/IN					in ladice	6.5 Moderate to strong c	ementation 6.5' to 10'.			
\87600014-NERT-M12\WORK	- - 10				আকাল	10.0 (SM)	1745	_2_		
3813		мс	15-25-30			Silty SAND with Grav	vel, light brown (7.5YR 6/3),			
- NTIS318FS1/CES/PROJEC	- - -	CC	(55)			20/65/15/0, fine to co medium dense, mois	parse sand, fine to coarse gravel, st, well graded.	2" Schedule 40		
12:49 -	7							PVC blank casing.		
US.GDT - 11/10/17 12	15 _	MC	6-6-8 (14)				vel, light brown (7.5YR 6/3), parse sand, fine to coarse gravel, st, well graded.			
ENTAL BH - GINT STD	_	СС				Silty SAND, light bro coarse sand, moist, v	wn (7.5YR 6/3), 0/85/15/0, fine to well graded.	Bentonite grout.		
ENVIRON	20	MC	18-28-40				vel, light brown (7.5YR 6/3), parse sand, fine to coarse gravel,			

BORING NUMBER UFIW-01D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

	PROJ	ECT NUN	IBER 194-	-87600012-	M13		PROJECT LOCATION Henderson, NV	
3 LOGS.GPJ	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	WELL DIAGRAM
L M			(68)				medium dense, moist, well graded. (SM) (continued)	
ENVIRONMENTAL BH - GINT STD US. GDT - 11/10/17 12:49 - \\TTS318FS1/CES\PROJECTS\87600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TEST\FIELD PROGRAMBORING LOGS\GINTTALL M13 LOGS\GPJ		CC						
PROC		мс	33-50-36				Silty SAND with Gravel, light brown (7.5YR 6/3), 20/65/15/0, fine to coarse sand, fine to coarse gravel,	
	_		(86)				medium dense, moist, well graded.	
TABILITY TEST/F		СС				28.0	1727.2 (ML)	
TREA								
J CR	30							
IN-SIT	_ 50 _	V					Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low	
KING\	_	MC	25-70				plasticity, fine to medium sand, hard, moist.	
WOR							77	
37600014-NERT-M12		СС					∑	
CTS/8	35							
S1/CES/PROJE		МС	2-4-6 (10)				Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low plasticity, fine to medium sand, hard, wet.	
7/17 12:49 - NTTS318F		СС						→ Hydrated bentonite chip seal.
11/10	40							
STD US.GDT -		MC	6-6-8 (14)				Sandy SILT, brown (7.5YR 4/4), 0/20/80/0, no to low plasticity, fine to medium sand, hard, moist.	
L BH - GINT S								
NMENTA		○ NR						
ENVIRO	45							#3 Monterey Sand.
- 1							(Continued Novt Done)	

BORING NUMBER UFIW-01D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ	(#) (#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	W	/ELL DIAGRAM
ING LOGS/GINT/ALL M13	-	MC	14-18-19 (37)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 5/20/75/0, no plasticity, fine sand, wet, cemented nodules.		2" Schedule 40 PVC 0.020" slotted screen.
ITY TEST\FIELD PROGRAM\BOR	50	CC MC	5-7-7 (14)			Sandy SILT, brown (7.5YR 4/3), 0/20/80/0, low to no plasticity, fine sand, medium stiff, wet.		
INCESIPROJECTS\87600014-NERT-M12\WORKING\IN-S\TU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS\GINTALL M13 LOGS\GPJ	55	СС	7-10-12			Sandy SILT, brown (7.5YR 4/3), 0/20/80/0, low to no plasticity, fine sand, medium stiff to stiff, wet, little fine		→ Hydrated bentonite chips.
JECTS\87600014-NERT-M12\W	- - -	СС	(22)			gravel.		
	60	MC	7-7-13 (20)		6	Sandy SILT, light brown (7.5YR 6/4), 15/20/60/0, low to no plasticity, fine sand, medium stiff to stiff, wet. Bottom of borehole at 61.5 feet.	1693.7	
.GDT - 11/10/17 12:49 - \								
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS								
ENVIRONMEN								

BORING NUMBER UFIW-02S PAGE 1 OF 2

	TŁ	TETRA TECH, INC.
ı		150

'								
CLI	ENT Neva	ıda Environ	mental Res	ponse Tru	st (NERT)	PROJECT NAME NERT - AP Area T	Гreatabi	ility Study
PR	OJECT NUI	IBER 194	-87600012-	M13		PROJECT LOCATION Henderson, N	٧V	
DA	TE STARTE	D 7/8/16		COMPL	ETED 7/20/16	GROUND ELEVATION 1754.97 ft	но	DLE SIZE 8 in
DR	LLING CO	NTRACTOR	National E	EWP		WATER LEVEL AT TIME OF DRILLIN	IG	
1			ow Stem Au			WATER LEVEL AFTER DRILLING 27		
5 l					ED BY M. Crews	<u>=-</u>		
2 1	_				ed well box.			
		<u> </u>						
DEPTH	SAI	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
0 1 1 1 1 1 1 1 1 1				0.5 6.0	Moderate to strong co	ementation 6' to 10'. SYR 5/4), 10/70/20/0, fine to sticity, medium dense to very desne, ell.	<u>1754.5</u>	Bentonite grout. 2" Schedule 40 PVC blank casing.
	-				Silty SAND, brown (7	5YR 5/4), 10/70/20/0, fine to to medium dense, moist, little fine		→ Hydrated bentonite chip seal.
					incaram sana, 100se	to modium dende, molet, intile line		

BORING NUMBER UFIW-02S



TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US. GDT - 11/10/17 12:49 - NITS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING\N-SITU CR TREATABILITY TESTHELD PROGRAMBORING LOGS/GINTALL M13 LOGS/GINTALL M12 LOGS/GINTALL M13 LOGS/GIN	-				gravel. (SM) (continued) Silty SAND, brown (7.5YR 5/4), 10/70/20/0, fine to medium sand, medium dense, moist, little fine gravel. [28.0] (ML) Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, moist. Bottom of borehole at 28.1 feet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
VPROJECTS\87600014-NERT-M12\WORKING\IN-SITU C						
8H - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\CE						
ENVIRONMENTAL E						

BORING NUMBER UFIW-02I



CLIE	ENT Neva	da Environ	mental Resp	onse ⁻	Γrust (NERT)	PROJECT NAME NERT - AP Area	Treatab	ility Study						
PRO	JECT NUM	IBER 194	-87600012-1	M13		PROJECT LOCATION Henderson, NV								
DAT	E STARTE	D <u>7/11/16</u>	<u> </u>	СОМ	PLETED _7/21/16	GROUND ELEVATION 1754.85 ft	нс	OLE SIZE 8 in						
DRII	LLING CON	ITRACTOR	National E	WP		WATER LEVEL AT TIME OF DRILLING 32.00 ft / Elev 1722.85 ft								
DRII	LLING MET	HOD Holl	7.06 ft /	Elev 1727.79 ft										
LOG	LOGGED BY Daniel Keady CHECKED BY M. Crews NOTES Well completed with an 18" traffic-rated well box.													
тои	ES Well	completed	with an 18" t	raffic-r	ated well box.									
DEPTH (#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	MATERIAL DESCRIPTION								
	-					own (7.5YR 5/4), 10/70/20/0, fine to sticity, medium dense to very dense,	1754.4	Casing Type: Schedule 40 PVC						
5	_				5.5 Moderate to strong co	ementation 5.5' to 10'.	1749.4							
10					(SM) Silty SAND, brown (7 medium sand, medium fine gravel.	.5YR 5/4), 10/70/20/0, fine to m dense to very dense, moist, little	1744.9	■ Bentonite grout.						
15					Silty SAND, brown (7 sand, medium dense	7.5YR 5/4), 0/80/20/0, fine to medium e, moist.		2" Schedule 40 PVC blank casing.						
20					Silty SAND, brown (7 medium sand, loose	7.5YR 5/4), 10/70/20/0, fine to to medium dense, moist, little fine								

BORING NUMBER UFIW-02I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC		MATERIAL DESCRIPTION	WELL DIAGRAM
					gravel. (SM) (continued) Silty SAND, brown (7.5YR 5/4), 10/70/20/0, fine to medium sand, medium dense, moist, little fine gravel.	◄ Hydrated bentonite chip seal.
				28.0	(ML)	1726.9
					Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, moist.	
					Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet, small silt lenses.	#3 Monterey Sand 2" Schedule 40 PVC 0.020" slotted screen.
				41.1	Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet. Bottom of borehole at 41.1 feet.	1713.8
	SAMPLE TY NUMBER	SAMPLE TY NUMBER NUMBER BLOW COUNTS (N VALUE (N VALUE	SAMPLE TY NUMBER BLOW COUNTS (N VALUE N VALUE DATA DATA	SAMPLE TY NUMBER BLOW COUNTS (N VALUE ENVIRONMEN DATA LOG LOG LOG	28.0	Silty SAND, brown (7.5YR 5/4), 10/70/20/0, fine to medium sand, medium dense, moist, little fine gravel. 28.0 (ML) Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet, small silt lenses. Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet, small silt lenses.

BORING NUMBER UFIW-02D



	CLIEN	IT Neva	da Environr	mental Res	oonse ⁻	Trust	(NERT)	PROJECT NAME NERT - AP Area	Treatab	oility Study		
F	PROJ	ECT NUN	IBER 194-	-87600012-	M13			PROJECT LOCATION Henderson, NV				
1	DATE	STARTE	D 7/12/16		COM	PLET	ED _7/20/16	GROUND ELEVATION _1755.01 ft HOLE SIZE _8 in				
1	DRILL	ING CON	ITRACTOR	National E	EWP			WATER LEVEL AT TIME OF DRILLING 32.00 ft / Elev 1723.01 ft WATER LEVEL AFTER DRILLING 27.15 ft / Elev 1727.86 ft				
_ [DRILL	ING MET	HOD Holle	ow Stem Au	ıger							
S)			Eric Peirce				DBY M. Crews					
3 L	NOTE	S Well	completed v	with an 18"	traffic-r	ated	well box.					
RING LOGS/GINT/ALL M13	O DEPIH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	ERIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC		
EKI-M12WVOKKINGIN-SITU CK TREATABILITY TESTIFIELD PROGRAMIBOKING LO	5					6.0	Asphalt. (SM) Silty SAND with 15/70/15/0, fine to medium dense, mois		1754.5			
S\8/600014-NE	10	V	15-25-30			10.0	(SM)		<u>1745</u> .0			
- 11/10/1/ 12:49 - MIIS318FS1/CES/PROJECT:	-	СС	(55)				medium sand, mediu fine gravel.	im dense to very dense, moist, little			- 2" Schodulo 40	
2:49 -											−2" Schedule 40 PVC blank casing.	
US.GDI - 11/10/1/ 1	<u>15</u> _	МС	6-6-8 (14)				Silty SAND, brown (7 sand, medium dense	7.5YR 5/4), 0/80/20/0, fine to medium e, moist.				
IKONMENTAL BH - GINT STD US.GDT	20	СС									■Bentonite grout.	
ENVIRO		MC	18-28-40				Silty SAND, brown (7 medium sand, loose	7.5YR 5/4), 10/70/20/0, fine to to medium dense, moist, little fine				

BORING NUMBER UFIW-02D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

-	PROJECT NUMBER _194-87600012-M13					PROJECT LOCATION Henderson, NV						
3 LOGS.GPJ	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	WELL DIAGRAM				
L M 13		X	(68)				gravel. (SM) <i>(continued)</i>					
ENVIRONMENTAL BH - GINT STD US GDT - 1/1/0/17 12:49 - N/TTS318FS1/CES/PROJECTS/87/600014-NERT-M/12/WORKING/IN-S/TU CR TREATABILITY TESNFIELD PROGRAMBORING LOGS/GINTALL M/11.005.6PJ	25	СС					Silty SAND, brown (7.5YR 5/4), 10/70/20/0, fine to					
PROC		мс	33-50-36 (86)				medium sand, medium dense, moist, little fine gravel.					
		<u> </u>	(00)									
∠ ŒS	_						$ar{m{\lambda}}$					
ABILT THE	_	СС				28.0	(ML) 1727.	0				
ITU CR TREAT	30											
10/IN-0		мс	25-70				Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, moist.					
ORKI PK	_											
S\87600014-NERT-M12\W	- - -	CC					$oxtilde{oxtilde{ox}}$					
	35						Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low					
ES/PR	_	МС	2-4-6 (10)				plasticity, fine sand, medium stiff to stiff, wet, little silt lenses.					
2:49 - \\TTS318FS1\C	_	СС						⊸ Hydrated bentonite				
0/17	_							chip seal.				
- 11/1	40											
US.GD		мс	6-6-8 (14)				Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff, wet, little silt lenses.					
SID			(14)									
ENIAL BH - GIN		CC										
Z Z Z	-											
	45							#3 Monterey Sand.				

BORING NUMBER UFIW-02D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(H) 22 (H) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	14-18-19 (37)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff, wet.	2" Schedule 40 PVC 0.020" slotted screen.
50	CC	577			Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low	
 	MC CC	5-7-7 (14)			plasticity, fine sand, medium stiff to stiff, wet.	
45 50 	MC	7-10-12 (22)			Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	≺Hydrated bentonite chips.
 	СС					
60	MC	7-7-13 (20)		61.	Sandy SILT, brown (7.5YR 5/4), 0/25/75/0, no to low plasticity, fine sand, medium stiff, wet. Bottom of borehole at 61.5 feet.	1693.5

BORING NUMBER UFIW-03S PAGE 1 OF 2



	CLIEN	T Neva	da Environ	mental Resp	onse Tr	rust (NERT)	PROJECT NAME NERT - AP Area Treatability Study					
	PROJI	ECT NUN	/IBER _194	-87600012-	M13		PROJECT LOCATION Henderson, NV					
	DATE	STARTE	D 7/11/16	<u> </u>	СОМР	LETED 7/14/16	GROUND ELEVATION _1	1755.22 ft HO	OLE SIZE 8 in			
	DRILL	ING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME	OF DRILLING 32.0	00 ft / Elev 1723.22 ft			
	DRILL	ING MET	HOD Holl	ow Stem Au	ıger		WATER LEVEL AFTER D	PRILLING 27.35 ft /	/ Elev 1727.87 ft			
2	LOGG	ED BY _	Daniel Kea	dy		KED BY _M. Crews						
000	NOTE	S Well	completed	with an 18" i	raffic-ra	ted well box.						
112												
ALL		SAMPLE TYPE NUMBER	တ္ထ	ENVIRONMENTAL DATA	o							
- NIIC	DEPTH (ft)	E T 18EI	N I	TA	HO	MATE	RIAL DESCRIPTION		WELL DIAGRAM			
200	DEI (i	MPL	BLOW COUNTS (N VALUE)	S Q	GRAPHIC LOG	WIATE	TUAL DEGOTAL TION		WELL DIAGITAIN			
פר		SAI		\geq					Ossina Tura Oshadula 40 DVO			
Ž Z	0			Ш	0	.5 Asphalt.		1754.7	Casing Type: Schedule 40 PVC			
AIVID						(SM) Silty SAND, bro	wn (7.5YR 5/4), 10/70/20/0	0, fine to				
אַ						medium sand, mediu gravel	m dense to very dense, dr	y, little fine				
7						graver.						
Ĭ												
2												
<u>-</u>												
ABIL												
Z Z Z	5											
ť												
2					6	.0		1749.2				
0-VII						Moderate to strong ce	ementation 6' to 10'.					
פ												
20												
N Z												
<u>-</u>												
14-12									■Bentonite grout.			
0000	10				1	0.0		1745.2				
2/0/						(SM) Silty SAND, brown (7	.5YR 5/4), 15/60/25/0, fine	e to coarse				
						sand, fine to coarse g	gravel, moist.	c to course				
אל												
SES												
212												
25												
-									2" Schedule 40			
7.43									PVC blank casing.			
116	15					Silty SAND brown (7	.5YR 5/4), 15/60/25/0, fine	e to coarse				
=						sand, fine to coarse g	ravel, moist, increasing gr	avel and				
- -						cemented nodules wi	th depth.					
ر ان												
מוכ												
Į.												
ر ا - ا												
ALE												
NEN.	20											
	20					Silty SAND, brown (7	.5YR 5/4), 15/60/25/0, fine	e to coarse				
IN V						sand, fine to coarse g	gravel, moist, increasing gr	avel and	→ Hydrated bentonite chip seal.			
-												

BORING NUMBER UFIW-03S

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					cemented nodules with depth. (SM) (continued)	
					Silty SAND, brown (7.5YR 5/4), 15/60/25/0, fine to coarse sand, fine to coarse gravel, moist, increasing gravel and cemented nodules with depth.	-#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
30					(ML) Sandy SILT, dark yellowish brown (10YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, moist.	Hydrated bentonite chips.
35					Bottom of borehole at 35.0 feet.	1720.2
25 30 35						

BORING NUMBER UFIW-03I



1					t (NERT)	PROJECT NAME NERT - AP Area Treatability Study			
1			-87600012-1		TED 7/45/40	PROJECT LOCATION Henderson,		E 017E 0 in	
1			Netional F		TED _7/15/16			LE SIZE 8 in	
1			National E			WATER LEVEL AT TIME OF DRILLII			
> 			ow Stem Au		D BY _M. Crews	WATER LEVEL AFTER DRILLING 2	7.02 ft / E	<u>elev 1727.87 ft</u>	
2			with an 18" t						
	VVCII V			Tame-rated	Well box.				
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC	
			ш	0.5	Asphalt.		1754.4	Sasing Type. Scriedule 401 VC	
2 5					(SM) Silty SAND, bro	wn (7.5YR 5/4), 10/70/20/0, fine to m dense to very desne, dry, little fine			
<u>-</u>				6.0	Moderate to strong ce	ementation 6' to 10'	1748.9		
10				10 <u>.0</u>	(SM)		1744.9		
						.5YR 5/4), 15/60/25/0, fine to coarse gravel.			
į – –								Bentonite grout. 2" Schedule 40	
15					0.111 0.11.12	(EVD EIA) AE(00/05/0 5		PVC blank casing.	
					Silty SAND, brown (7 sand, moist, little fine	5YR 5/4), 15/60/25/0, fine to coarse gravel.	K		
						.5YR 5/4), 15/60/25/0, fine to coarse			
20					Cemented nodules.				
					Silty SAND, brown (7 sand, fine to coarse of	.5YR 5/4), 15/70/15/0, fine to coarse gravel, dense to very dense, moist.			

BORING NUMBER UFIW-03I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

DEРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	WELL DIAGRAM
25						Silty SAND, brown (7.5YR 5/4), 15/70/15/0, fine to coarse sand, fine to coarse gravel, dense to very dense, moist, little small cobbles present. Silty SAND, brownish yellow (10YR 6/6), 5/75/20/0, fine to medium sand, low plasticity (silt), fine to medium gravel, very dense, moist, little cemented nodules.	
30					30.0	(ML) Sandy SILT, dark yellowish brown (10YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, moist.	1724.9 ◄ Hydrated bentonite chip seal.
35 _						Sandy SILT, yellowish red (5YR 5/6), 0/25/75/0, low plasticity, fine to medium sand, medium stiff to stiff, wet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted
40					40.0	Bottom of borehole at 40.0 feet.	screen.

BORING NUMBER UFIW-03D



П						(NERT)					
- 1				-87600012-I			PROJECT LOCATION Henderson,				
- 1							GROUND ELEVATION 1755.38 ft				
- 1				National E			WATER LEVEL AT TIME OF DRILLI				
ы				ow Stem Au	_		WATER LEVEL AFTER DRILLING 2	7.43 ft / Ele	ev 1727.95 ft		
2						D BY M. Crews					
	NOTE	S well d	completed v		traffic-rated	well box.					
ING EOGS/GIN I WEE IN	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAI DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION	Cas	WELL DIAGRAM sing Type: Schedule 40 PVC		
					0.5	Asphalt.		1754.9			
	5				6.0	(SM) Silty SAND, bro	wn (7.5YR 5/4), 15/70/15/0, fine to sticit, loose to medium dense, dry.	1749.4			
10000 14-14-14-14-14-14-14-14-14-14-14-14-14-1					10.0			1745.4			
WI 133181 3 NOES IN 138	 	МС	21-24-25 (49)			Silty SAND, brown (7	.5YR 5/4), 10/70/20/0, fine to avel, medium dense, dry.				
									2" Schedule 40 PVC blank casing.		
2.00.01.1 - 100.0	15 _	МС	15-15-13 (28)			Silty SAND, brown (7 medium sand, fine gr	.5YR 5/4), 10/70/20/0, fine to avel, medium dense, moist.				
L BIT - GIN I SID C		СС				Silty SAND, brown (7 medium sand, mediu	.5YR 5/4), 10/70/20/0, fine to m dense, dry.		■ Bentonite grout.		
	7					Cemented nodules.			Denionite grout.		
	20	MC	32-48-57				.5YR 5/4), 15/70/15/0, fine to coarse gravel, dense to very dense, moist.				

BORING NUMBER UFIW-03D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

	PROJ	ECT NUM	IBER 194	-87600012-	M13		PROJECT LOCATION Henderson, NV						
3 LOGS.GPJ	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION		WELL DIAGRAM				
_ M		\mathbf{X}	(105)				(SM) (continued)						
RAM/BORING LOGS/GINT/ALI		СС											
D PROG		МС	60-110				Silty SAND, brownish yellow (10YR 6/6), 5/75/20/0, fine to medium sand, fine to medium gravel, very dense, moist, little cemented nodules.						
ENVIRONMENTAL BH - GINT STD US. GDT - 11/10/17 12:49 - \\TTS318FS1/CES\PROJECTS\87600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTTALL M13 LOGS\GPJ		СС				30.0	<u>Y</u>	1725.4					
ING/IN-SI		МС	3-8-10 (18)				(ML) Sandy SILT, dark yellowish brown (10YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, moist.						
2\WORK			(10)			Z							
ECTS\87600014-NERT-M12		СС											
S\PROJE		МС	7-6-9 (15)				Sandy SILT, yellowish red (5YR 5/6), 0/25/75/0, low plasticity, fine to medium sand, medium stiff to stiff, wet.						
10/17 12:49 - \\TTS318FS1\CE	 	СС	(10)										
STD US.GDT - 11/	40	MC	5-6-8 (14)				Sandy SILT, reddish brown (5YR 5/4), 0/15/85/0, low plasticity, fine sand, medium stiff, wet.		→ Hydrated bentonite chip seal.				
BH - GINT :	_												
NMENTAL		СС											
ENVIRO	45												
1							(Continued New Borns)						

BORING NUMBER UFIW-03D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

(#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
45 	MC	4-4-7 (11)			(ML) (continued) Sandy SILT, reddish brown (5YR 5/4), 0/15/85/0, low plasticity, fine sand, medium stiff, wet.	#3 Monterey Sand.
50	CC	4042			Sandy SILT, reddish brown (5YR 5/4), 0/15/85/0, low	PVC 0.020" slotted screen.
	MC MC	4-9-12 (21)			plasticity, fine sand, medium stiff to stiff, wet, little cemented nodules.	
_ 55	мс	4-8-9 (17)			Sandy SILT, reddish brown (5YR 5/4), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet, little cemented nodules.	≺ Hydrated bentonite
	cc					chips.
60	мс	4-9-10 (19)		6		-
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFIW-04S PAGE 1 OF 2



CLIE	NEVa	da Environ	mental Res	oonse Tr	ust (NERT)	PROJECT NAME NERT - AP Area	Treatab	ility Stud	у	
PRC	JECT NUM	IBER 194	-87600012-	M13		PROJECT LOCATION Henderson,	, NV			
DAT	E STARTE	D 7/11/16		COMPI	LETED 7/18/16	GROUND ELEVATION 1755.28 ft	но	HOLE SIZE 8 in		
DRII	LING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME OF DRILL	ING			
1			ow Stem Au			WATER LEVEL AFTER DRILLING 2			27 97 ft	
5 l	GED BY									
2 1	_				ed well box.					
2		<u> </u>								
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION			NELL DIAGRAM /pe: Schedule 40 PVC	
				0.			1754.8			
	-				(SM) Silty SAND, brownedium sand, fine gra	wn (7.5YR 5/3), 15/60/25/0, fine to avel, loose to medium dense, dry.				
<u>{</u> }	-			6.	Moderate to strong ce	mentation 6' to 10'	1749.3			
10	-			1(0.0		<u>1745</u> .3		■Bentonite grout.	
	-					el, brown (7.5YR 5/4), 20/55/25/0, ne to coarse gravel, dry, cemented				
15	_				Silty SAND with Grave fine to coarse sand, find cemented nodules.	el, brown (7.5YR 5/4), 20/55/25/0, ne to coarse gravel, moist,			2" Schedule 40 PVC blank casing.	
20					Silty SAND, brown (7. sand, moist, cemente	5YR 5/4), 0/65/35/0, fine to coarse d nodules.			◄ Hydrated bentonite chip seal.	

BORING NUMBER UFIW-04S PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

PROJECT LOCATION Henderson, NV

Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules. ##3 Monterey Sand. Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules. ##3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.	LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
⊒ 1727.3	ABILITY TESTIFIELD PROGRAMBPRING LOGS/GINTALL M13 LOGS, GPJ				28	Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules. Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules.	2" Schedule 40 PVC 0.020" slotted screen.

ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \NTS318FS1/CES\PROJECTS\87600014-NERT-M12\WORKING\IN-S\TU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS\GPJ

BORING NUMBER UFIW-04I



	CLIEN	T Neva	da Environi	mental Res	ponse ⁻	Trust	(NERT)	PROJECT NAME NERT - AP Area Treatability Study				
	PROJI	ECT NUN	IBER 194	-87600012-				PROJECT LOCATION Henderson, NV				
	DATE	STARTE	D 7/11/16		COM	PLET	ED 7/21/16	GROUND ELEVATION 1755.33 ft	HOL	E SIZE 8 in		
	DRILL	ING CON	ITRACTOR	National I	EWP			WATER LEVEL AT TIME OF DRILLII	NG 32.00	ft / Elev 1723.33 ft		
\rfloor	DRILL	ING MET	HOD Holl	ow Stem Au	uger			WATER LEVEL AFTER DRILLING $\underline{2}$	7.42 ft / E	lev 1727.91 ft		
S.GP	LOGG	ED BY	Daniel Kea	dy	CHE	CKED	BY M. Crews					
PGG	NOTE	S Well	completed v	with an 18"	traffic-r	ated	well box.					
ING LOGS/GINT/ALL M13	o DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	ERIAL DESCRIPTION	C	WELL DIAGRAM sasing Type: Schedule 40 PVC		
BOR						0.5	Asphalt.		1754.8			
CR TREATABILITY TEST/FIELD PROGRAMBORING LO							(SM) Silty SAND, bromedium sand, fine g	own (7.5YR 5/3), 15/60/25/0, fine to ravel, loose to medium dense, dry.				
ITU CR						6.0			1749.3			
/87600014-NERT-M12/WORKING\\N-SIT						10.0	Moderate to strong o	ementation 6' to 10'.	1745.3			
7 12:49 - \\TTS318FS1\\CES\PROJECTS\8	 						Silty SAND with Grav	vel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse gravel, dry, cemented		Bentonite grout. 2" Schedule 40 PVC blank casing.		
RONMENTAL BH - GINT STD US GDT - 11/10/17	20						fine to coarse sand, cemented nodules.	vel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse gravel, moist,				
ENVIRC								7.5YR 5/4), 20/55/25/0, fine to coarse noist, cemented nodules.				

BORING NUMBER UFIW-04I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	WELL DIAGRAM
						(SM) (continued) Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules. Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules.	
						(ML) Sandy SILT, brown (7.5YR 5/4), 0/15/85/0, no to low plasticity, fine sand, soft to stiff, moist.	Hydrated bentonite chip seal.
35					38.0	Sandy SILT, brown (7.5YR 5/4), 0/15/85/0, no to low plasticity, fine sand, soft to stiff, wet. Bottom of borehole at 38.0 feet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.

BORING NUMBER UFIW-04D

PAGE 1 OF 3



PROJECT NAME NERT - AP Area Treatability Study **CLIENT** Nevada Environmental Response Trust (NERT) PROJECT LOCATION Henderson, NV **PROJECT NUMBER** 194-87600012-M13 **DATE STARTED** 7/11/16 **COMPLETED** 7/18/16 **GROUND ELEVATION** 1755.39 ft **HOLE SIZE** 8 in DRILLING CONTRACTOR National EWP WATER LEVEL AT TIME OF DRILLING 32.00 ft / Elev 1723.39 ft DRILLING METHOD Hollow Stem Auger WATER LEVEL AFTER DRILLING 27.43 ft / Elev 1727.96 ft ENVIRONMENTAL BH. GINT STD US, GDT. - 1/1/10/17 12:49 - WITS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS, GP., LOGGED BY Daniel Keady CHECKED BY M. Crews NOTES Well completed with an 18" traffic-rated well box. ENVIRONMENTAL DATA SAMPLE TYPE NUMBER GRAPHIC LOG BLOW COUNTS (N VALUE) DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 PVC Asphalt. 0.5 1754.9 (SM) Silty SAND, brown (7.5YR 5/3), 15/60/25/0, fine to medium sand, fine gravel, loose to medium dense, dry. 5 6.5 Moderate to strong cementation 6.5' to 10'. 10 10.0 1745.4 20-28-40 Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, MC (68)fine to coarse sand, fine to coarse gravel, dry, cemented nodules. CC 2" Schedule 40 PVC blank casing. 15 Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, 24-21-31 fine to coarse sand, fine to coarse gravel, moist, МС cemented nodules. (52)Bentonite grout. CC 20 Silty SAND, brown (7.5YR 5/4), 0/65/35/0, fine to coarse 13-23-43 sand, moist, cemented nodules.

BORING NUMBER UFIW-04D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

PRO	DJECT N	JMBER _194	-87600012-l	M13	PROJECT LOCATION Henderson, NV					
3 LOGS.GPJ DEPTH	SAMPLE TYPE NUMBER		ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION		WELL DIAGRAM		
L M1;	X	(66)				(SM) (continued)				
AAM/BORING LOGS/GINT/AL	_ C0					Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules.	X111X111X1			
ELD PROGF	Mo	30-31-30 (61)				Silty SAND with Gravel, brown (7.5YR 5/4), 20/55/25/0, fine to coarse sand, fine to coarse gravel, moist, cemented nodules.				
LITY TEST/FI					0.82	Ā	1727.4			
REATAB	C					(ML)				
를 30 물 30										
ORKING\IN-SI	Mo	3-5-11 (16)				Sandy SILT, brown (7.5YR 5/4), 0/15/85/0, no to low plasticity, fine sand, soft to stiff, moist.				
ECTS\87600014-NERT-M12\Wv	_ C0					Ā	$ar{ar{ u}}$	X111X111X111X		
CES/PROJEC	M	4-5-7 (12)				Sandy SILT, brown (7.5YR 5/4), 0/15/85/0, no to low plasticity, fine sand, soft to stiff, wet.				
ENVIRONMENTAL BH - GINT STD US.GDT - 11/0/17 12:49 - \ TTS318FS1/CES\ PROJECTS\ R7600014-NERT-M12\ WORKING\ N-SITU CR TREATABILITY TESTFIELD PROGRAMBORING LOGS\ GINTALL M13 LOGS\ GINTALL M12 L	CC			40			1715.4	Hydrated bentonite chip seal.		
STD US.GDT	M	17-14-18 (32)				(SM) Silty SAND with Gravel, pink (7.5YR 8/3), 25/60/15/0, fine to coarse sand, low to no plasticity (silt), fine to coarse gravel, medium dense to dense, wet.	10			
DINT L	-				42.0	(ML)	1713.4			
IMENTAL BH	Co					(ML) Sandy SILT, pink (7.5YR 8/3), 0/20/80/0, no to low plasticity, fine sand, wet.				
NO - 45							1.	# #3 Monterey Sand.		

BORING NUMBER UFIW-04D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ 4P DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM				
ING LOGS/GINT/ALL M13	MC	5-15-10 (25)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	2" Schedule 40 PVC 0.020" slotted screen.				
INCESIPROJECTS/87600014-NERT-M12/WORKING\IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS.GPJ	СС	5-15-22 (37)				Sandy SILT, brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff to very stiff, wet.				
SITU CR TREATABILITY TE	СС	. ,								
NERT-M12WORKING\\\\\-	MC	9-20-25 (45)			Sandy SILT, brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff to very stiff, wet.	→ Hydrated bentonite chips.				
ES/PROJECTS/87600014-	СС									
	мс	6-7-13 (20)		61.	Sandy SILT, brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	1693.9				
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS	, , , ,			,,,,,,,	Bottom of borehole at 61.5 feet.					

BORING NUMBER UFIW-05S

	TŁ	TETRA TECH, INC.
ı		176

CLIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - AP Area Treatability Study										
	ETED _7/27/16 GROUND ELEVATION _1759.63 ft H	OLE SIZE 8 in								
	WATER LEVEL AT TIME OF DRILLING									
.	WATER LEVEL AFTER DRILLING 28.00 ft									
LOGGED BY Joel Lagade CHECK										
NOTES _Well completed with an 18" traffic-rated well box.										
SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) CALUE DATA LOG	MATERIAL DESCRIPTION	WELL DIAGRAM Casing Type: Schedule 40 PVC								
0.										
	(SM) Silty SAND, yellowish red (5YR 4/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel.									
5 5	Silty SAND, yellowish red (5YR 4/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel, cemented nodules.									
	Silty SAND, brown (7.5YR 4/4), 10/70/20/0, fine to medium sand, fine to medium gravel, loose, moist.	■Bentonite grout.								
15	Silty SAND, brown (7.5YR 4/4), 10/70/20/0, fine to medium sand, loose, moist, some fine to medium gravel, cemented nodules.	2" Schedule 40 PVC blank casing.								
20	Silty SAND, brown (7.5YR 4/4), 10/70/20/0, fine to medium sand, loose, moist, trace fine to medium gravel,	Hydrated bentonite chip seal.								

BORING NUMBER UFIW-05S

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US. GDT - 11/10/17 12:49 - \\TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\NN-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS\GPJ BE \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	SAMP	AN)	ENVIRO	29.5	increasing silt content. (SM) (continued) No Recovery Bottom of borehole at 30.0 feet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT STD US.GD						

BORING NUMBER UFIW-05I



	CLIEN	T Neva	da Environr	mental Res	ponse T	rust (NERT)	PROJECT NAME NERT - AP Area Treatability Study				
			IBER 194				PROJECT LOCATION Henderson, NV				
			D 7/15/16				GROUND ELEVATION 1759.71 ft HOLE SIZE 8 in				
			ITRACTOR				WATER LEVEL AT TIME OF DRILLII				
اح			HOD Holle				WATER LEVEL AFTER DRILLING 2	8.10 ft / Elev	<u>/ 1731.61 ft</u>		
SS.GF		_				KED BY M. Crews					
	NOTES Well completed with an 18" traffic-rated well box.										
PROGRAM/BORING LOGS/GINT/ALL M13	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION	Casi	WELL DIAGRAM ng Type: Schedule 40 PVC		
BOR					(0.4 Asphalt		1759.3			
TEST\FIELD	 					(SM) Silty SAND, yellowish medium sand, loose,	n red (5YR 4/6), 10/75/15/0, fine to moist, few fine gravel.				
112/WORKING\IN-SITU CR TREATABILITY	5					Silty SAND, yellowish medium sand, loose, nodules.	n red (5YR 4/6), 10/75/15/0, fine to moist, few fine gravel, cemented				
CES/PROJECTS/87600014-NERT-N	10 _					Silty SAND, brown (7 medium sand, fine to	.5YR 4/4), 10/70/20/0, fine to medium gravel, loose, moist.				
0/17 12:49 - \\TTS318FS1\CES\PRC	 15								Bentonite grout. 2" Schedule 40 PVC blank casing.		
TAL BH - GINT STD US.GDT - 11/10/17	 										
ENVIRONMENTAL	20					Silty SAND, brown (7 medium sand, fine to	.5YR 4/4), 10/70/20/0, fine to medium gravel, loose, moist.				

BORING NUMBER UFIW-05I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 25 					(SM) (continued) Silty SAND, brown (7.5YR 4/4), 10/70/20/0, fine to medium sand, loose, moist, trace fine to medium gravel, increasing silt content.	
30					(ML) Sandy SILT, strong brown (7.5YR 4/6), 0/20/80/0, no to low plasticity, fine sand, very stiff, moist, trace clay.	→ Hydrated bentonite chip seal.
35					▼ Trace cemented nodules. Sandy SILT, strong brown (7.5YR 4/6), 0/20/80/0, low plasticity, fine sand, very stiff, wet, trace clay.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
40					Sandy SILT, strong brown (7.5YR 4/4), 0/20/80/0, low plasticity, fine sand, medium stiff, wet, trace clay. Bottom of borehole at 40.0 feet.	0.7

BORING NUMBER UFIW-05D



CLIE	ENT Neva	ıda Environn	mental Res	ponse ⁻	Trust (NERT)		PROJECT NAME NERT - AP Area Treatability Study			
PRO	DJECT NUN	/IBER <u>194</u> -	87600012-	M13			PROJECT LOCATION Henderson, NV			
DAT	E STARTE	D 7/15/16		СОМ	PLETED _7/26	/16	GROUND ELEVATION 1759.78 ft HOLE SIZE 8 in WATER LEVEL AT TIME OF DRILLING 33.50 ft / Elev 1726.28 ft			
DRII	LLING CON	NTRACTOR	National I	EWP						
_ I	LLING MET	HOD Hollo	ow Stem Au	uger			WATER LEVEL AFTER DRILLING $\underline{28}$.20 ft / Elev 17	′31.58 ft	
FOG	GED BY	Joel Lagade	Э	CHE	CKED BY M. (Crews				
S NOT	TES Well	completed v	vith an 18"	traffic-r	ated well box.					
RING LOGS/GINT/ALL M13 DEPTH (#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	ERIAL DESCRIPTION		WELL DIAGRAM Type: Schedule 40 PVC	
MBOF					0.4 Asphal	t		1759.4		
LITY TEST\FIELD PROGRAM	-				(SM) Silty S/ mediur	AND, yellowish n sand, loose,	n red (5YR 4/6), 10/75/15/0, fine to moist, few fine gravel.			
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ \textites11887\\\ CES\PROJECTE						n sand, loose,	n red (5YR 4/6), 10/75/15/0, fine to moist, few fine gravel, cemented			
DESIPROJECTS\87600014-NERT-N	MC	8-16-23 (39)					7.5YR 4/4), 10/70/20/0, fine to medium gravel, loose, moist.			
17 12:49 - \\TTS318FS1\(\)	- CC								2" Schedule 40 PVC blank casing.	
S.GDT - 11/10/	MC	15-30-40 (70)			mediur		7.5YR 4/4), 10/70/20/0, fine to moist, some fine to medium gravel,			
MENTAL BH - GINT STD UE	- - - -								⋖ Bentonite grout.	
M 20	MC	18-27-33					7.5YR 4/4), 10/70/20/0, fine to moist, trace fine to medium gravel,			

BORING NUMBER UFIW-05D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

	PROJ	ECT NUN	IBER 194	-87600012-N	113	PROJECT LOCATION Henderson, NV					
3 LOGS.GPJ	DEPTH (ft) SAMPLE TYPE		SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) ENVIRONMENTAL DATA		GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM				
L M 1		X	(60)	Ţ.		increasing silt content. (SM) (continued)					
RAM/BORING LOGS/GINT/AL	25	CC									
ROG						No Recovery					
TABILITY TEST/FIELD P		○ NR ○ NR	50			Ā					
TRE	_			:							
UCR	20					9.5 1730 (ML)	3				
RKING\IN-SIT	30 _	MC	8-12-22 (34)			Sandy SILT, strong brown (7.5YR 4/6), 0/20/80/0, low plasticity, fine sand, very stiff, moist, trace clay.					
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \"ITS318FS1/CES\PROJECTS\87600014-NERT-M12\WORKING\IN-S\ITU CR TREATABILITY TEST\FIELD PROGRAMBORING LOGS\GINTALL M13 LOGS\GPJ	35	СС				abla					
SI SI		V	23-27-30			Sandy SILT, strong brown (7.5YR 4/6), 0/20/80/0, low					
TS318FS1\CES\P	_	MC	(57)			plasticity, fine sand, very stiff, wet, trace clay. Trace cemented nodules.					
/10/17 12:49 - NT	_	СС									
STD US.GDT - 11,	40	MC	4-6-8 (14)			Sandy SILT, strong brown (7.5YR 4/4), 0/20/80/0, low plasticity, fine sand, medium stiff, wet, trace clay.	→ Hydrated bentonite chip seal.				
BH - GINT	_										
SONMENTAL	_	СС									
ENVIF	45										
						(Continued Nort Bons)					

BORING NUMBER UFIW-05D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ PDEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
NG LOGS/GINT/ALL M13	МС	2-4-6 (10)			(ML) (continued) SILT with clay, strong brown (7.5YR 4/6), 0/15/70/15, medium plasticity, medium stiff, wet, some fine sand, increasing clay content.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
NFIELD PROGRAM/BORI	CC	3-5-6	-		SILT, brown (7.5YR 5/4), 1/5/91/3, medium plasticity, wet, trace fine sand and clay, cemented nodules.	
OR TREATABILITY TEST	МС	(11)				
NOCESIPROJECTS/87600014-NERT-M12WORKING/IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS.GPJ Part	MC	4-3-6 (9)			SILT, strong brown (7.5YR 4/6), 0/15/70/15, low plasticity, medium stiff, wet, some fine sand and clay.	→ Hydrated bentonite chips.
S/PROJECTS/87600014-NEI	CC					
	МС	4-6-8 (14)		61	SILT, strong brown (7.5YR 4/6), 0/15/70/15, low plasticity, medium stiff, wet, some fine sand and clay, trace cemented nodules.	1698.3
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS					Bottom of borehole at 61.5 feet.	1096.3

BORING NUMBER UFIW-06S PAGE 1 OF 2

	TŁ	TETRA TECH, INC.
ı		15

CLIEN	IT Neva	da Environ	mental Res	ponse Tru	st (NERT)	PROJECT NAME NERT - AP Area Treatability Study							
PROJ	ECT NUM	IBER 194	-87600012-	M13		PROJECT LOCATION Henderson, N	٧V						
DATE	STARTE	D 7/15/16	i	COMPL	ETED 7/29/16	GROUND ELEVATION 1759.76 ft	HOI	LE SIZE 8 in					
DRILL	ING CON	ITRACTOR	National I	EWP		WATER LEVEL AT TIME OF DRILLIN	IG						
DRILLING METHOD Hollow Stem Auger WATER LEVEL AFTER DRILLING 28.20 ft / Elev 1731.56 ft													
5 l	LOGGED BY _Joel Lagade CHECKED BY _M. Crews												
ġ l	NOTES Well completed with an 18" traffic-rated well box.												
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC					
				0.4			1759.4						
					(SM) Silty SAND, yell to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.							
5					Little cemented fragm	nents							
5				6.0			1753.8						
				1	Moderate to strong ce		17 55.0						
				10.	0		1749.8						
						rel, brown (7.5YR 5/4), 17/63/20/<1, ine gravel, hard, moist.		■Bentonite grout.					
15					Silty SAND with Grav fine to coarse sand, f	rel, brown (7.5YR 5/4), 15/63/22/0, ine gravel, hard, moist.		2" Schedule 40 PVC blank casing.					
20					to coarse sand, fine g	gravel, white (7.5YR 8/1), 15/63/22/0, fine gravel, hard, moist.							
					sand, low plasticity, n	noist.							

BORING NUMBER UFIW-06S

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ DEPTH (ff)	SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) ENVIRONMENTAL DATA GRAPHIC LOG LOG NOITHING NAME OF TYPE NUMBER TYPE NUMB		WELL DIAGRAM		
IELD PROGRAMBORING LOGS/GINTALL M13				(SM) (continued) 25.0 (SW-SM) SAND with Silt, brown (7.5YR 4/4), 10/80/10/<1, fine to medium sand, low plasticity (silt), well graded, moist.	Hydrated bentonite chip seal. 1734.8
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS\GD\ DE \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\				SAND with Gravel and Silt, brown (7.5YR 5/3), 20/70/10/0, medium to coarse sand, very dense, hard (silt), wet, trace cemented nodules, increasing gravel and coarse sand with depth.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
I/CES/PROJECTS/87600014-NERT-M12				Bottom of borehole at 32.0 feet.	
IS.GDT - 11/10/17 12:49 - \\TTS318FS1					
ENVIRONMENTAL BH - GINT STD U					

BORING NUMBER UFIW-06I

[7	$[\mathbf{t}]^{\scriptscriptstyle 1}$	ΓETRA	TECH	-			BONING	PAGE 1 OF 2
CLIEN	NT Neva	da Environr	mental Res	sponse	Trust	(NERT)	PROJECT NAME NERT - AP Area Trea	tability Study
- 1		IBER 194-					PROJECT LOCATION Henderson, NV	
DATE	STARTE	D 7/15/16		CON	IPLE1	FED 8/1/16	GROUND ELEVATION 1759.71 ft	HOLE SIZE 8 in
DRILL	ING CON	NTRACTOR	National	EWP			WATER LEVEL AT TIME OF DRILLING 3	0.00 ft / Elev 1729.71 ft
DRILI	ING MET	HOD Holle	ow Stem A	uger			WATER LEVEL AFTER DRILLING 28.17	ft / Elev 1731.54 ft
- 1				_		D BY M. Crews		
NOTE	S Well	completed v		traffic-	rated	well box.		
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATI	ERIAL DESCRIPTION	WELL DIAGRAM Casing Type: Schedule 40 PVC
2					0.4	Asphalt	1759	0.3
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 14:33 - P:\87600012-NERT-M13\WORKING\SOIL FLUSHING IRMFIELD PROGRAMBORING LOGS\GINTALL M13 LOGS\GPJ					6.0	Moderate to strong of (SM)	210wish red (5YR 4/6), 10/75/15/0, fine isse, moist, few fine gravel. 1750 Dementation 6' to 10'.	
TD US.GDT - 1/1/10/17 14:33 - P:\87600012-NERT-M13\WORK C						silty SAND with Gra 25/60/15/0, fine to c medium dense, mois	ddish brown (5YR 6/4), 10/70/20/0, fine se, moist, few fine to coarse gravel. evel, reddish brown (5YR 4/3), oarse sand, fine to large gravel, st. brown (5YR 4/3), 5/80/15/0, fine to um dense, moist, little fine gravel.	2" Schedule 40 PVC blank casing. Bentonite grout.
ENVIRONMENTAL BH - GINT S							brown (5YR 4/3), 10/75/15/0, fine to um dense, moist, little fine gravel.	

(Continued Next Page)

BORING NUMBER UFIW-06I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

	PROJ	ECT NUM	IBER 194	-87600012-	M13		PROJECT LOCATION Henderson,	NV		
	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION		WELL DIAGR	AM
ENVIRONMENTAL BH - GINT STD US. GDT - 1110/17 14:33 - P:87600012-NERT-M13!WORKING\SOIL FLUSHING IRMFIELD PROGRAMBORING LOGS\GINTALL M13 LOGS\GPJ	25					27.0 28.0 30.5	(SM) (continued) Silty SAND with Gravel, reddish brown (5YR 5/3), 20/60/20/0, fine to coarse sand, fine to large gravel, dense, moist. Silty SAND with Gravel, reddish brown (5YR 5/3), 20/60/20/0, fine to coarse sand, fine to large gravel, dense, moist, trace large gravel. Gravelly SAND with Silt, reddish brown (5YR 5/3), 25/65/10/0, fine to coarse sand, fine to large gravel, medium dense to very dense, moist. (GP) Sandy GRAVEL, dark reddish brown (5YR 3/3), 70/20/10/0, fine gravel, sub-angular, fine to coarse sand, proist, little silt. (SM) Silty SAND with Gravel, reddish brown (5YR 3/3), 15/70/15/0, fine to coarse sand, fine to large gravel, moist, cemented nodules, wet at 30.5'. (ML) Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low to no plasticity, fine sand, wet. Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low to no plasticity, fine sand, wet.	1732.7 1731.7 1729.2	#3 Montered 2" Schedu PVC 0.020 screen.	ey Sand. le 40

BORING NUMBER UFIW-06D



1					Trust	(NERT)	PROJECT NAME NER			' Study
1			-87600012-l				PROJECT LOCATION			
1		D 7/15/16				TED 7/29/16	GROUND ELEVATION			SIZE 8 in
1			National E				WATER LEVEL AT TIME			
?			ow Stem Au				WATER LEVEL AFTER	DRILLING 28	.38 ft / Ele	ev 1731.47 ft
ġ l	_					M. Crews				
NOT	ES Well of	completed v	with an 18" t	traffic-r	ated	well box.				
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION		Cas	WELL DIAGRAM sing Type: Schedule 40 PVC
			ш		0.4	Asphalt.			1759.5	N N N N N N N N N N N N N N N N N N N
	-					(SM) Silty SAND, yel	owish red (5YR 4/6), 10/3 loose, moist, few fine gra	75/15/<1,		
	-					Little cemented fragn	nents.			
					6.0				1753.9	
	_					Moderate to strong co	ementation 6' to 10'.			
10					10.0				1749.9	
	MC	30-50				(SM) Silty SAND with Grav fine to coarse sand, f	el, brown (7.5YR 5/4), 17 ine gravel, hard, moist.	7/63/20/0,		
15.00.00.00.00.00.00.00.00.00.00.00.00.00	cc									2" Schedule 40 PVC blank casing.
100.00	МС	18-20-25 (45)				Silty SAND with Grav fine to coarse sand, f	el, brown (7.5YR 5/4), 15 ine gravel, hard, moist.	5/63/22/0,		
	cc					Silty SAND with Grav to coarse sand, fine (el, white (7.5YR 8/1), 15/ gravel, hard, moist.	/63/22/0, fine		
20										
20	MC	12-18-24				SAND with Silt, stron sand, moist.	g brown (7.5YR 5/6), 10/8	80/10/0, fine		■Bentonite grout.

BORING NUMBER UFIW-06D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

PR	OJEC	CT NUN	IBER 194-	87600012-	M13	PROJECT LOCATION Henderson, NV	
3 LOGS.GPJ DEPTH	(ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
L M1	X		(42)			(SM) (continued)	
RAM/BORING LOGS/GINT/AL	5	СС				25.0	
NOG NOG			40.50			(SW-SM) SAND with Silt, brown (7.5YR 4/4), 10/80/10/<1, fine to medium sand, low plasticity (silt), well graded,	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - NITS318FS1/CES/PROJECTS/87600014-NERT-M12WORKINGINN-SITU CR. TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS/	-	MC CC	10-50			moist.	
		мс	49-50-10			SAND with Gravel and Silt, brown (7.5YR 5/3), 20/70/10/0, medium to coarse sand, no plasticity (silt), very dense,	
ORKIN -		IVIC	(60)			hard (silt), wet, trace cemented nodules, increasing gravel and coarse sand with depth.	
-M12\W	+				******	32.0 (ML) 1727.	
ECTS\87600014-NERT	5	СС					
PROJE			4-8-16			Sandy SILT, reddish brown (7.5YR 6/6), 0/40/58/2, low plasticity, very fine sand, stiff, wet.	
NTTS318FS1/CES/	<u> </u>	MC	(24)				
- 11/10/17 12:49 - \		СС					
I STD US.GDT		МС	9-8-18 (26)			SILT with Sand, strong brown (7.5YR 5/6), 0/20/70/10, low plasticity, very fine sand, stiff, wet.	
H-GIN	+						
ONMENTAL B		СС					Hydrated bentonite chip seal.
SINAL 4!	5						
						(Continued Next Devel	

BORING NUMBER UFIW-06D

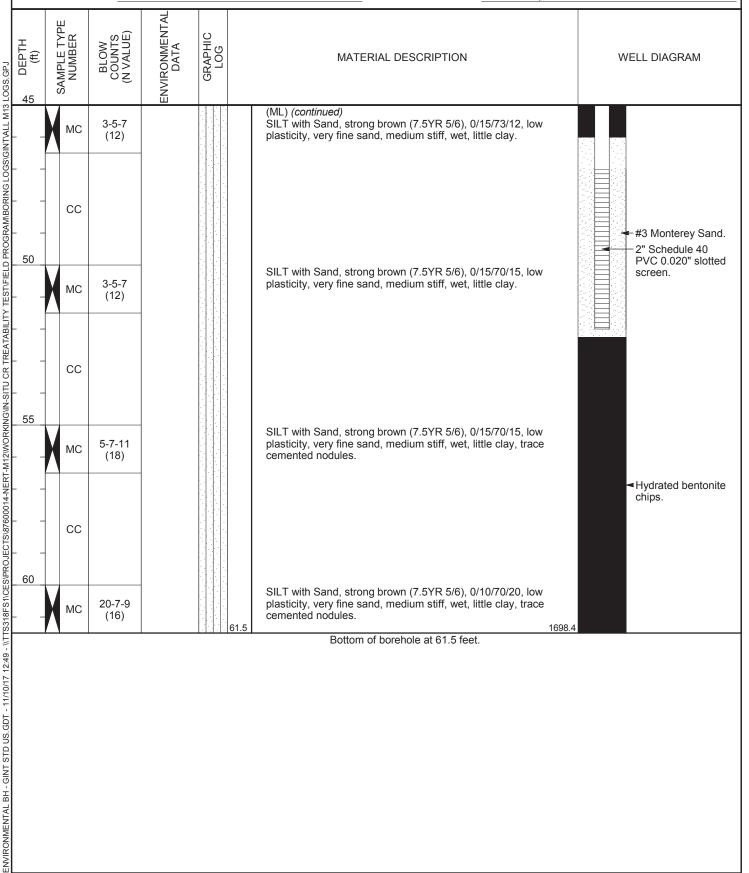
PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13



BORING NUMBER UFIW-07S PAGE 1 OF 2

	TŁ	TETRA TECH, INC.
ı		15

1									
c	LIEN	T Neva	da Environr	mental Res	ponse Trus	t (NERT)	PROJECT NAME NERT - AP Area	Treatab	pility Study
1							PROJECT LOCATION Henderson,		
	ATE	STARTE	D 7/14/16		COMPLE	TED 8/1/16	GROUND ELEVATION 1759.76 ft	нс	OLE SIZE 8 in
	RILL	ING CON	TRACTOR	National	EWP		WATER LEVEL AT TIME OF DRILLII	NG	
	RILL	ING MET	HOD Holle	ow Stem A	uger		WATER LEVEL AFTER DRILLING 2	8.20 ft /	Elev 1731.56 ft
L	.OGG	ED BY	Eric Peirce		CHECKE	D BY M. Crews			
Š N	OTE	S Well o	completed v	with an 18"	traffic-rated	I well box.			
	_	YPE R	S E)	ENTAL	O				
L C G S G IN I	(#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION		WELL DIAGRAM
	0	0)		Ш Х	0.4	Aonhalt		4750.4	Casing Type: Schedule 40 PVC
	-				0.4	Asphalt (SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.	1759.4	
	5				6.0	Little cemented fragn	nents.	1753.8	
5	1				1.1.1.10.0	Moderate to strong c	ementation 6' to 8'.	1733.0	
	_				8.0			1751.8	
1	10					(SM)			■Bentonite grout.
100 100	-						vel, reddish brown (5YR 5/3), parse sand, fine gravel, dense, moist,		
100.0	- 15 -								2" Schedule 40 PVC blank casing.
	20					Silty SAND, brown (7 sand, dense, moist.	7.5YR 5/4), 5/75/20/0, fine to medium		

BORING NUMBER UFIW-07S

PAGE 2 OF 2

TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA GRAPHIC	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US. GDT - 17/0/17 12:49 - NITS318FS1/CESVPROJECTS\87/800014-NERT-M12\WORKING\NN-SITU CK TREATABILITY TEST/FIELD PROGRAMMBORING LOGS\GFT OF THE CONTROLL OF THE CON			(SM) (continued) Y Silty SAND with Gravel, reddish brown (5YR 5/3), 15/65/20/0, fine to medium sand, fine gravel, dense, moist, little coarse gravel. Bottom of borehole at 31.0 feet.	Hydrated bentonite chip seal. #3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.

BORING NUMBER UFIW-07I



CLIEN	IT Neva	da Environi	mental Resp	oonse ⁻	Trust (NERT)	PROJECT NAME NERT - AP Area Treata	ability Study
1			-87600012-l			PROJECT LOCATION Henderson, NV	
DATE	STARTE	D 7/14/16		СОМ	MPLETED 8/5/16	GROUND ELEVATION 1759.63 ft 1	IOLE SIZE 8 in
DRILL	ING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME OF DRILLING 30	.00 ft / Elev 1729.63 ft
DRILL	ING MET	HOD Holl	ow Stem Au	iger		WATER LEVEL AFTER DRILLING 28.10 ft	
LOGG	ED BY	Hao Zhang		CHE	CKED BY M. Crews		
NOTE	S Well o	completed v	with an 18" t	raffic-r	rated well box.		
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MAT	ERIAL DESCRIPTION	WELL DIAGRAM Casing Type: Schedule 40 PVC
5					0.4 Asphalt (SM) Silty SAND, ye to medium sand, loc	ellowish red (5YR 4/6), 10/75/15/0, fine ose, moist, few fine gravel.	V/1 V/1
					6.0	thents. 1753.6 cementation 6' to 10'.	
10					(SM) Silty SAND with Gra 15/70/15/0, fine to n dense, moist.	avel, reddish brown (5YR 5/3), nedium sand, few coarse gravel,	
15							2" Schedule 40 PVC blank casing. Bentonite grout.
20					Silty SAND with Gra 6/84/10/0, fine to co	avel, reddish brown (5YR 5/3), arse sand, fine gravel, moist.	

BORING NUMBER UFIW-07I

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DЕРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
25					(SM) (continued)	
30					Silty SAND with Gravel, reddish brown (5YR 5/3), 6/84/10/0, fine to coarse sand, fine gravel, moist. (ML) Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, soft to stiff, wet.	1728.6 ✓ Hydrated bentonite chip seal.
35						
40					SILT with Sand, strong brown (7.5YR 5/6), 0/10/90/0, low plasticity, fine sand, soft to stiff, wet. Bottom of borehole at 41.4 feet.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.

BORING NUMBER UFIW-07D

PAGE 1 OF 3



				•		Trust	(NERT)	PROJECT NAME NER			Study
				-87600012-N				PROJECT LOCATION _	Henderson, NV	'	
	DATE	STARTE	D <u>7/15/16</u>		COM	IPLET	ED 7/27/16	GROUND ELEVATION	1759.79 ft	HOLE	SIZE 8 in
	DRILL	ING CON	ITRACTOR	National E	WP			WATER LEVEL AT TIME	OF DRILLING	30.00 f	t / Elev 1729.79 ft
	DRILL	ING MET	HOD Holl	ow Stem Au	ger			WATER LEVEL AFTER	DRILLING 28.3	5 ft / Ele	ev 1731.44 ft_
9. G	LOGG	ED BY _	Daniel Kea	dy	CHE	CKED	BY M. Crews				
E C C	NOTES	S Well o	completed v	vith an 18" t	raffic-r	ated v	well box.				
RING LOGS/GIN I VALL M13	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION		Cas	WELL DIAGRAM sing Type: Schedule 40 PVC
A D A						0.4	Asphalt			59.4	
KEATABILIT TESTAFIELD PROGRAMME							(SM) Silty SAND, yel to medium sand, loos	owish red (5YR 4/6), 10/7 se, moist, few fine gravel.	75/15/0, fine		
<u>-</u> لا							Little cemented fragn	nents.			
	_					6.0			17	53.8	
-NN5							Moderate to strong co	ementation 6' to 10'.			
7600014-NEKI-MTZWVORNIN						10.0			<u>17</u>	49.8	
ROJEC 15/8		МС	8-30-50 (80)				(SM) Silty SAND with Grav 15/70/15/0, fine to mo dense, moist.	el, reddish brown (5YR 5. edium sand, few coarse g	/3), ravel,		
1/ 12:49 - WI ISSIBES INCESIE		СС									2" Schedule 40 PVC blank casing.
/0L/LL - 1U5		мс	8-35-50 (85)				Silty SAND with Grav to medium sand, den	el, white (5YR 8/1), 15/70 se, moist.)/15/0, fine		
ENTAL BH - GINT STD US.GD	 	СС									
ENVIRONM	20	MC	27-30-33				Silty SAND, brown (7 dense, moist.	.5YR 5/4), 5/70/25/0, very	y fine sand,		■Bentonite grout.

(Continued Next Page)

BORING NUMBER UFIW-07D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
×		(63)			(SM) (continued)	
25	СС				Silty SAND, brown (7.5YR 4/4), 5/70/25/0, fine sand, dense, moist.	
C	NR				Silty SAND, brown (7.5YR 4/4), 5/75/20/0, fine sand, dense, moist.	
30	СС				Ţ.	
	МС	12-14-16 (30)			Silty SAND, strong brown (7.5YR 5/6), 5/75/20/0, fine sand, medium dense, wet. (ML)	3
 	СС				SILT with Sand, strong brown (7.5YR 5/6), 0/20/70/10, low to medium plasticity, fine sand, soft to stiff, wet.	
35	MC	4-7-9 (16)			SILT with Sand, strong brown (7.5YR 5/6), 0/20/70/10, low to medium plasticity, fine sand, medium stiff, wet.	
	CC					
40	MC	3-12-27 (39)			SILT with Sand, strong brown (7.5YR 5/6), 0/15/83/2, low to medium plasticity, fine sand, medium stiff, wet.	
	СС					→ Hydrated bentonite chip seal.
1						

BORING NUMBER UFIW-07D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) (#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
45 	МС	3-9-12 (21)			(ML) (continued) SILT with Sand, strong brown (7.5YR 5/6), 0/15/83/2, low to medium plasticity, fine sand, stiff, wet.	
 50	СС					#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
	MC	4-5-7 (12)			SILT with Sand, strong brown (7.5YR 5/6), 0/20/70/10, low plasticity, fine sand, medium stiff, moist to wet, trace cemented nodules.	
 55	CC					
	МС	3-4-7 (11)			SILT with Sand, strong brown (7.5YR 5/6), 0/20/70/10, very low plasticity, fine sand, medium stiff to stiff, moist.	→ Hydrated bentonite chips.
	СС					
	мс	5-5-7 (12)			SILT with Sand, brown (7.5YR 5/4), 0/20/70/10, very low plasticity, fine sand, medium stiff to stiff, moist, trace cemented nodules.	
				61.5	Bottom of borehole at 61.5 feet.	98.3

BORING NUMBER UFIW-08S PAGE 1 OF 2

	TŁ	TETRA TECH, INC.
U	100.00	15

CLIEN	IT Neva	da Environi	mental Resp	onse ⁻	Trust	(NERT)	PROJECT NAME NERT - AP Area	Treatabi	lity Study
PROJI	ECT NUM	IBER <u>194</u>	-87600012-l	M13			PROJECT LOCATION Henderson, I	NV	
DATE	STARTE	D 7/14/16	<u> </u>	COM	PLE1	ED _7/28/16	GROUND ELEVATION 1759.6 ft	HO	LE SIZE 8 in
DRILL	ING CON	TRACTOR	National E	WP			WATER LEVEL AT TIME OF DRILLIN	NG	
DRILL	ING MET	HOD Holl	ow Stem Au	iger			WATER LEVEL AFTER DRILLING 28	3.02 ft /	Elev 1731.58 ft
LOGG	ED BY _	Daniel Kea	dy	CHE	CKED	BY M. Crews			
NOTE	S Well o	completed v	with an 18" t	raffic-r	ated	well box.			
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG			RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
 5					0.4	Asphalt (SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.	1759.2	
					6.0	Moderate to strong co		1753.6	■ Bentonite grout.
8 10					10.0	(SM) Silty SAND with Grave fine to medium sand, decreasing gravel control of the	rel, brown (7.5YR 5/4), 15/70/15/0, loose, fine to coarse gravel, moist,	1749.6	
15						Silty SAND, brown (7 medium sand, loose,	.5YR 4/3), 10/70/20/0, fine to moist, few fine gravel, trace cobbles.		2" Schedule 40 PVC blank casing.
20						Silty SAND, brown (7 medium sand, loose,	.5YR 4/3), 10/70/20/0, fine to moist, few fine gravel, trace cobbles.		

BORING NUMBER UFIW-08S

PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\CES\PROJECTS\87600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS.GDJ \ DE	SAMPI	N N N N N N N N N N N N N N N N N N N	ENVIRO	27.	(SM) (continued) (SW-SM) SAND with Silt, brown (7.5YR 5/3), 10/77/10/3, fine to coarse sand, well graded, very dense, moist, some cemented nodules.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT STD US. GD1						

BORING NUMBER UFIW-08I



	CLIEN	IT Neva	da Environi	mental Res	ponse 7	Trust (NERT)	PROJECT NAME NERT - AP Area	Treatabi	lity Study
			/IBER _194				PROJECT LOCATION Henderson,	NV	
	DATE	STARTE	D _7/14/16		COM	PLETED <u>8/3/16</u>	GROUND ELEVATION 1759.61 ft	но	LE SIZE 8 in
	DRILL	ING CON	NTRACTOR	National	EWP		WATER LEVEL AT TIME OF DRILLI	NG 34.00	0 ft / Elev 1725.61 ft
	DRILL	ING MET	HOD Holl	ow Stem A	uger		WATER LEVEL AFTER DRILLING 2	27.96 ft / I	Elev 1731.65 ft
S.GPJ	LOGG	ED BY _	Jon Coen		CHE	CKED BY M. Crews			
	NOTE	S Well	completed v	with an 18"	traffic-ra	ated well box.			
ING LOGS/GINT/ALL M13	O DEPTH (ff)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
BOR.						0.4 Asphalt		1759.2	
ZWORKING\\N-SITU CR TREATABILITY TEST\FIELD PROGRAM\\BORING LO	5					(SM) Silty SAND, ye to medium sand, loo	llowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.		
IS/87600014-NERT-M12/WORKIN	10					10.0 (SM)	vel, brown (7.5YR 5/4), fine to	1749.6	
0/17 12:49 - \\TTS318FS1\CES\PROJEC						medium sand, loose	, moist, some cobbles.		Bentonite grout. 2" Schedule 40 PVC blank casing.
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17						Silty SAND with Gra medium sand, loose	vel, brown (7.5YR 5/4), fine to , moist, some cobbles.		

BORING NUMBER UFIW-08I

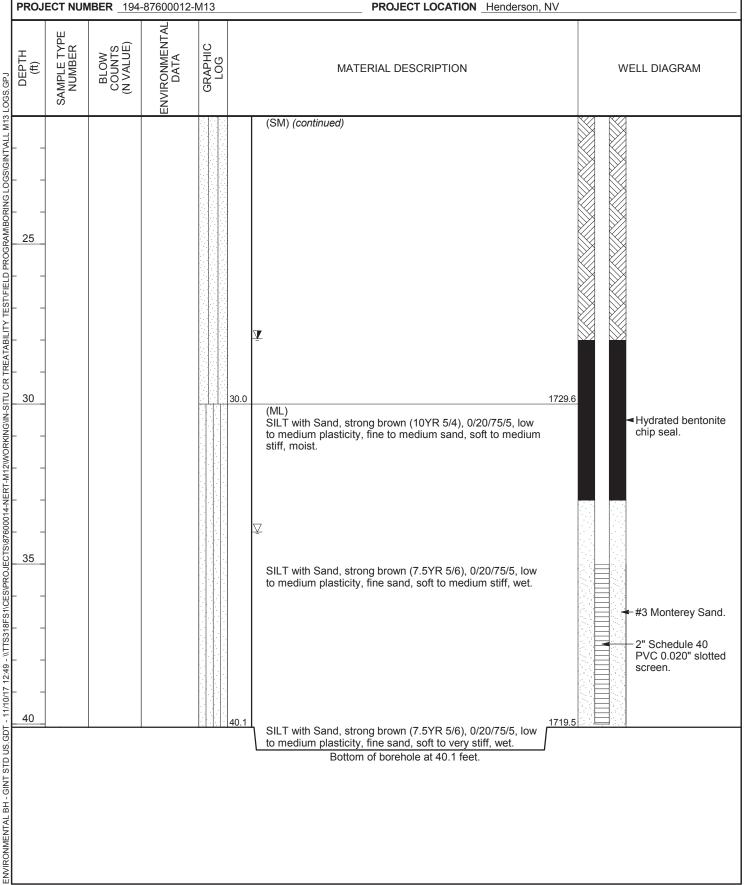
PAGE 2 OF 2



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13



BORING NUMBER UFIW-08D



0.4 Asphalt (SM) Silty SAND, yellowish red (5YR 4/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel. Cemented fragments. Cemented fragments. 1759.4 Cemented fragments. 1759.4 Cemented fragments. 1753.3 Moderate to strong cementation 6.5' to 10'. 1753.3 MC 14-22-27 (49) MC 14-22-27 (49) Silty SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to medium sand, loose, fine to coarse gravel, moist, decreasing gravel content. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles.	1										
DATE STARTED 7:1416 COMPLETED 7:2816 GROUND ELEVATION 1759.77 ft HOLE SIZE 8 in DRILLING CONTRACTOR National EVIP WATER LEVEL AT TIME OF DRILLING 34.00 ft/ Elev 1725.77 ft DRILLING STARTED 1:1610 w Stem Auger CHECKED BY M. Crews NOTES Well completed with an 18' traffic-rated well box.		CLIEN.	T Neva	da Environi	mental Resp	onse ⁻	Trust	(NERT)	PROJECT NAME NERT - AP Area	Treatab	ility Study
DRILLING CONTRACTOR National EMP MATERIAL DESCRIPTION MATERIAL DESCRIPTION WELL DIAGRAM D	-	PROJE	ECT NUM	IBER 194	-87600012- i	M13			PROJECT LOCATION Henderson,	NV	
DRILLING CONTRACTOR Netional EMP DRILLING METHOD Hollow Stem Auger LOGGED BY Daniel Ready OHECKED BY M. Crews NOTES Well completed with an 16" traffic-rated well box. WELL DIAGRAM Daniel Ready AND WARTER LEVEL AFTER DRILLING 29.14 ft / Elev 1731.63 ft WELL DIAGRAM Casing Type: Schedule 40 PVC Cemented fragments. DA A Asphalt Silly SAND, yellowish red (5YR 4/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel. AND WARTER LEVEL AFTER DRILLING 29.14 ft / Elev 1731.63 ft WELL DIAGRAM Casing Type: Schedule 40 PVC Cemented fragments. Cemented fragments. Cemented fragments. Cemented fragments. Silly SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to medium sand, loose, moist, few fine gravel, moist, decreasing gravel content. Silly SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to medium sand, loose, moist, few fine gravel, moist, decreasing gravel content. Silly SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/80/10/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/80/10/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9 Silly SAND, pink (SYR 8/3), 10/70/20/0, fine to medium 1741.9		DATE	STARTE	D 7/14/16	DLE SIZE 8 in						
DRILLING METHOD Hollow Stem Auger CHECKED BY M. Crews WATER LEVEL AFTER DRILLING 28.14 ft / Filev 1731.63 ft OCCUPANTES Well completed with an 18" traffic-rated well box. MATERIAL DESCRIPTION WELL DIAGRAM Casing Type: Schedule 40 FVC Cemented fragments. OLA Asphalt (SM) Silty SAND, yellowish red (6VR 4/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel. OCCUPANT M. C14-22-27 (49) MC 14-45-50 (85) MMC 10-45-50 (85) MMC 10-45-50 (85) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/80/10/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Silty SAND, pink (6YR 8/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel.											
LOGGED BY Daniel Keady CHECKED BY M. Crews NOTES Well completed with an 19" traffic-rated well box. HE SE LIGHT STREET S											
NOTES Well completed with an 18" traffic-rated well box.									WATER LEVEL AFTER DRILLING 2	0.14 1(/	Elev 1731.03 It
Material Description Well Diagram Well Diagram Casing Type: Schedule 40 PVC Material Material Description Material Descript	9		_								
0.4 Asphit (SM) Silly SAND, yellowish red (SYR 4/6), 10/75/15/0, fine 1759.4 (SM) Silly SAND, yellowish red (SYR 4/6), 10/75/15/0, fine 1759.4 (SM) Silly SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to medium sand, loose, fine to coarse gravel, moist, decreasing gravel content. 15		NOTES	yveii (completed v		ranic-r	ated	well box.			
Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. Cemented fragments.	ING LOGS/GIN I WLL MT		SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION		
to medium sand, loose, moist, few fine gravel. Cemented fragments. Cemented fragments. 175.3 Moderate to strong cementation 6.5' to 10'. Moderate to strong cementation 6.5' to 10'. (SM) Silty SAND with Gravel, brown (7.5YR.5/4), 15/70/15/0, fine to medium sand, loose, fine to coarse gravel, moist, decreasing gravel content. CC Silty SAND, brown (7.5YR.4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. 22' Schedule 40 PVC blank casing. Silty SAND, brown (7.5YR.4/3), 10/70/20/0, fine to medium 1741.8 sand, loose, moist, few fine gravel. (SM) Silty SAND, prown (7.5YR.4/3), 10/70/20/0, fine to medium 1741.9 sand, loose, moist, few fine gravel. Silty SAND, brown (7.5YR.4/3), 10/70/20/0, fine to medium 1741.9 sand, loose, moist, few fine gravel.	5						0.4				
MC 14-22-27 (49) MC 14-22-27 (49) MC 10-45-50 (95) MC 10-45-50 (95) CC (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. 2" Schedule 40 PVC blank casing. 18.0 (SP) SAND, pink (5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, prown (7.5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM)	T LEST VFIELD PROGRAMME	 									
Moderate to strong cementation 6.5' to 10'. Moderate to strong cementation 6.5' to 10'. 1749.8		_									
MC 14-22-27 (49) MC 14-22-27 (49) MC 10-45-50 (95) MC 10-45-50 (95) CC (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. 2" Schedule 40 PVC blank casing. 18.0 (SP) SAND, pink (5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, prown (7.5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/80/10/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM) Silty SAND, pink (5YR 8/3), 10/70/20/0, fine to medium 1741.8 (SM)	<u> </u>							Cemented fragments			
10		5									\gg
10											
Moderate to strong cementation 6.5' to 10'. 10.0 (SM) Silty SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to medium sand, loose, fine to coarse gravel, moist, decreasing gravel content. 2" Schedule 40 PVC blank casing. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. CC 15 CC 18.5 (SP) SAND, pink (5YR 8/3), 10/80/10/0, fine to medium 1741.8 sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.8 sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.8 sand, loose, moist, few fine gravel.	?						6.5			1752.2	
10						- 1-15-	0.5	Moderate to strong co	ementation 6.5' to 10'.	1755.5	
MC 14-22-27 (49) Silty SAND with Gravel, brown (7.5YR 5/4), 15/70/15/0, fine to coarse gravel, moist, decreasing gravel content. CC Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. Silty SAND, pink (5YR 8/3), 10/80/10/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM)	JOU 14-INER I -IM I ZWORKI						10.0			1749.8	
fine to medium sand, loose, fine to coarse gravel, moist, decreasing gravel content. CC Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. CC (SP) SAND, pink (5YR 8/3), 10/80/10/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM)	10/01	10	J				10.0			_1743.0	
Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel, trace cobbles. 18.5 (SP) SAND, pink (5YR 8/3), 10/80/10/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel. (SM) Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium sand, loose, moist, few fine gravel.	-SINCESIPROJECTS		МС					fine to medium sand,	loose, fine to coarse gravel, moist,		
MC 10-45-50 (95) MC 10-45-50 (95)	/1/ 12:49 - WI ISSISE	15	СС					Cille CAND brown (7	EVD 4/9) 40/70/90/0 5 to		
Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.3 Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.3 Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to medium 1741.3	STD US.GDI - 11/10		МС					medium sand, loose,	moist, few fine gravel, trace cobbles.		
Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to	MENIAL BH - GINI S		CC					sand, loose, moist, fe	R 8/3), 10/80/10/0, fine to medium ew fine gravel.		
	ENVIRONI	20	MC	10-17-35				Silty SAND, brown (7 medium sand, loose,	.5YR 4/3), 10/70/20/0, fine to moist, few fine gravel, trace cobbles.		Bentonite grout.

BORING NUMBER UFIW-08D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - AP Area Treatability Study

1	PROJI	ECT NUN	IBER <u>194-</u>	87600012-	M13		PROJECT LOCATION Henderson, N	/
LOGS.GPJ	DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	WELL DIAGRAM
L M13		X	(52)				(SM) (continued)	
SIPROJECTS/87600014-NERT-M-ZWORKING/IN-SITU CR TREATABILITY TESTFIELD PROGRAMBORING LOGS/GINTALL M3 LOGS/GPJ	- - - 25	СС					Silty SAND, brown (7.5YR 4/3), 10/70/20/0, fine to	
PRO		мс	48-50				medium sand, loose, moist, few fine gravel, trace cobbles.	
ATABILITY TEST/FIELD	- - -	СС	2.20			Ā	<u>Z</u>	
R TRE	-							
	30					30.0		729.8
ORKING/IN-S	-	мс	13-16-19 (35)				(ML) SILT with Sand, strong brown (7.5YR 5/6), 0/20/75/5, low to medium plasticity, fine sand, soft to medium stiff, moist.	
M12\W	-							
14-NERT-I	_	СС						
376000	-					∇	<u>Z</u>	
2 2 2 2 3	35							
ESIPROJ	_	мс	4-2-7 (9)				SILT with Sand, strong brown (7.5YR 5/6), 0/20/75/5, low to medium plasticity, fine sand, soft to medium stiff, wet.	
3FS1/C								
11831								
.49 - \	-	СС						
17 12	-							
11/4	40							
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \\TTS318FS1\CE	-	мс	4-8-12 (20)				SILT with Sand, strong brown (7.5YR 5/6), 0/20/75/5, low to medium plasticity, fine sand, soft to very stiff, wet.	
S N								→ Hydrated bentonite chip seal.
BH - C								
	7	СС						
NON ME	-							
	45						(Continued Next Page)	

BORING NUMBER UFIW-08D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	МС	3-3-12 (15)			(ML) (continued) SILT with Sand, strong brown (7.5YR 5/6), 0/20/75/5, low to medium plasticity, fine sand, soft to very stiff, wet, cemented nodules.	##3 Monterey Sand. 2" Schedule 40
50	СС					PVC 0.020" slotted screen.
	МС	4-4-8 (12)			SILT, brown (7.5YR 5/4), 1/5/86/8, low to medium plasticity, medium stiff to stiff, wet, trace fine sand and gravel, cemented nodules.	
 55	CC					
	МС	5-7-9 (16)			SILT, brown (7.5YR 5/4), 1/3/86/10, low to medium plasticity, medium stiff to stiff, wet, trace fine sand and gravel, trace cemented nodules.	→ Hydrated bentonite chips.
60	CC					
	мс	3-4-5 (9)		61.5	SILT, brown (7.5YR 5/4), 1/3/86/10, low to medium plasticity, medium stiff to stiff, wet, trace fine sand and gravel, trace cemented nodules.	698.3
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-01S



CLIEN	NT Neva	da Environr	mental Resp	onse T	rust (NERT)	PROJECT NAME NERT - AP Area	Treatab	pility Study
PROJ	ECT NUN	IBER _194	-87600012-I	M13		PROJECT LOCATION Henderson,	NV	
DATE	STARTE	н	OLE SIZE 12 in					
DRILL	ING CON	00 ft / Elev 1722.07 ft						
DRILL	ING MET	HOD Holle	ow Stem Au	iger		WATER LEVEL AFTER DRILLING 2	27.90 ft /	/ Elev 1727.17 ft
LOGG	SED BY _	Daniel Kea	dy	CHEC	CKED BY M. Crews			
NOTE	S Well	completed v	vith a 24" x	24" traf	fic-rated well vault. Well is co	o-located as part of a nested well con-	struction	1.
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4 Asphalt		1754.7	
5 - 5					(SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.	1748.6	
10				Allia	Moderate to strong or	ementation 6.5' to 10'.	1745.1	■ Bentonite grout.
	MC CC	14-30-50 (80)			Silty SAND, reddish t	brown (5YR 6/4), 10/60/30/0, fine to evel, dense, moist, cemented nodules		
15	V	40 44 42			Silty SAND, reddish b	brown (5YR 5/4), 10/60/30/0, fine to		2" Schedule 40 PVC blank casing.
20	MC CC	10-11-12 (23)			coarse sand, fine gra	ivel, medium dense to dense, moist.		
	мс	20-20-30			Silty SAND, reddish to coarse sand, fine gra	brown (5YR 5/4), 10/60/30/0, fine to livel, medium dense to dense, moist.		Hydrated bentonite chip seal.

BORING NUMBER UFMW-01S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

			87600012-		PROJECT LOCATION Henderson, NV	
ОЕРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	X	(50)			(SM) (continued) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand, no plasticity, medium dense, moist.	
25	СС	50-50-50 (100)			Silty SAND, reddish brown (5YR 5/4), 10/70/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.	##3 Monterey Sand.
35 	СС			20	9.0 (ML)	2" Schedule 40 PVC 0.020" slotted screen.
30	МС	3-5-4 (9)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	Hydrated bentonite pellets seal.
 	СС				abla	
35	МС	4-7-9 (16)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
 40	СС					screen.
	МС	4-5-7 (12)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	Hydrated bentonite pellets seal.
 	СС					
45						

TETRA TECH, INC.

BORING NUMBER UFMW-01S

PAGE 3 OF 3

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
мс	4-7-8 (15)			(ML) (continued) Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
СС				Coods CILT atract brown (7 EVD 5/4), 0/20/00/0, no to	
МС	4-6-8 (14)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	
CC					
МС	5-5-7 (12)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	→ Hydrated bentonite chips.
СС					
МС	6-6-6 (12)		61.5	Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	1693.6
				Bottom of borehole at 61.5 feet.	
	MC CC MC CC	MC 4-7-8 (15) CC MC 4-6-8 (14) CC MC 5-5-7 (12) CC	MC 4-7-8 (15) CC MC 4-6-8 (14) CC MC 5-5-7 (12) CC	MC 4-7-8 (15) CC MC 4-6-8 (14) CC MC 5-5-7 (12) CC MC 6-6-6 (12)	MC 4-7-8 (15) CC MC 4-6-8 (14) CC MC 5-5-7 (12) CC Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist. Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist. Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist. Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.

BORING NUMBER UFMW-01I



CLIEN	JT Neva	da Environ	mental Pesn	onea	Truet	(NERT)	PPO IECT NAME NE	PT - AP Area Ti	roatah	uility Study
1	ECT NUM	ility Study								
1		D 7/14/16			IPLE1	TED _7/22/16	PROJECT LOCATION GROUND ELEVATION			DLE SIZE 12 in
DRILL	ING CON	G 33.0	00 ft / Elev 1722.03 ft							
DRILL	ING MET	.79 ft /	Elev 1727.24 ft							
[]	SED BY _									
NOTE	S Well o	completed v		24" tra	iffic-ra	ated well vault. Well is co	o-located as part of a nes	sted well constr	ruction	<u>. </u>
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION			WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4	Asphalt			1754.6	
5						(SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10 se, moist, few fine gravel	/75/15/0, fine I.		
					6.5	Moderate to strong co	ementation 6.5' to 10'.	1	1748.5	
10					10.0			1	17 <u>45</u> .0	■ Bentonite grout.
	мс	14-30-50				(SM) Silty SAND, reddish t	prown (5YR 6/4), 10/60/3	30/0, fine to		
	cc	(80)				coarse sand, fine gra	vel, dense, moist, ceme	nted nodules.		
-										2" Schedule 40
15_										PVC blank casing.
	МС	10-11-12 (23)					orown (5YR 5/4), 10/60/3 vel, medium dense to de			
20	CC									
	мс	20-20-30					orown (5YR 5/4), 10/60/3 vel, medium dense to de		2	Hydrated bentonite

BORING NUMBER UFMW-01I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

		/IDEK 194-	0.0000.2		PROJECT LOCATION Henderson, INV	
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	CC	(50)			(SM) (continued) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand, no plasticity, medium dense, moist.	
35 	MC	50-50-50 (100)			Silty SAND, reddish brown (5YR 5/4), 10/70/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted
30	CC			29	.0 1726.0 (ML)	screen.
	мс	3-5-4 (9)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	Hydrated bentonite pellets seal.
 35	СС				∑ _	
 	МС	4-7-9 (16)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
40	СС				Cond. Cll T. atrana braum (7 FVD 544) 0/00/00/0	2" Schedule 40 PVC 0.020" slotted screen.
 	МС	4-5-7 (12)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	Hydrated bentonite pellets seal.
	СС					
45					(Continued Next Page)	Invitor: [1]

BORING NUMBER UFMW-01I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
45 	MC	4-7-8 (15)			(ML) (continued) Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
50	СС	400			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to	
 	MC MC	4-6-8 (14)			low plasticity, fine sand, medium stiff, moist.	
 55	мс	5-5-7 (12)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	→ Hydrated bentonite chips.
	СС	(12)				
60	MC	6-6-6 (12)		61.	Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist. Bottom of borehole at 61.5 feet.	1693.5
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-01D



CLIEN	IT Neva	da Environi	mental Res	ponse '	Trust	(NERT)	PROJECT NAME NERT - AP A	ea Treata	ability Study
PROJ	ECT NUN	IBER 194	-87600012-	M13			PROJECT LOCATION Henders	on, NV	
1					IPLE1	TED 7/22/16	GROUND ELEVATION 1755.12	ft H	IOLE SIZE 12 in
1			National E				WATER LEVEL AT TIME OF DRI		
.			ow Stem Au				WATER LEVEL AFTER DRILLING	27.89 ft	/ Elev 1727.23 ft
[]	_					DBY M. Crews			
NOTE		completed v		24" tra	ІПІС-Га	ated Well Vault. Well is co	o-located as part of a nested well o	onstructio	νn. Τ
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	FRIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4	Asphalt		1754.7	VI VI VI VI
5						(SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, f se, moist, few fine gravel.	ine	
<u>-</u>					6.5			1748.6	
					6.5	Moderate to strong c	ementation 6.5' to 10'.	1/40.0	Bentonite grout.
10					10.0	 (SM)		<u>1745</u> .1	
	МС	14-30-50 (80)				Silty SAND, reddish I	orown (5YR 6/4), 10/60/30/0, fine to vel, dense, moist, cemented nodu		
15	CC								2" Schedule 40 PVC blank casing.
13	мс	10-11-12				Silty SAND, reddish I coarse sand, fine gra	orown (5YR 5/4), 10/60/30/0, fine tovel, medium dense to dense, mois	o st.	
20	CC	(23)							
	МС	20-20-30				coarse sand, fine gra	prown (5YR 5/4), 10/60/30/0, fine to the transfer of the trans	st.	Hydrated bentonite chip seal.

BORING NUMBER UFMW-01D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - AP Area Treatability Study

PROJ	ECT NUM	IBER 194	-87600012-	M13	PROJECT LOCATION Henderson, NV	
LOGS.GPJ DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
IG LOGS/GINT/ALL M13	CC	(50)			(SM) (continued) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand, no plasticity, medium dense, moist.	
SIPROJECTS\87600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TEST\FIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS.GPJ C	MC	50-50-50 (100)			Silty SAND, reddish brown (5YR 5/4), 10/70/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted
TU CR TREATABILITY TI 0.0	СС				29.0 (ML)	screen.
T-M12WORKINGNN-SI	MC	3-5-4 (9)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	Hydrated bentonite pellets seal.
DECTS/87600014-NER.	СС				∑ Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to	
WTTS318FS1/CES/PRC	MC	4-7-9 (16)			low plasticity, fine sand, medium stiff, moist.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS1\CE \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	СС	4-5-7			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	
NTAL BH - GINT STD U:	CC	(12)				Hydrated bentonite pellets seal.
ENVIRONMER 45					(Continued Next Page)	

BORING NUMBER UFMW-01D PAGE 3 OF 3

TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ P DEPTH (ff)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM	
NG LOGS/GINT/ALL M13	MC	4-7-8 (15)			(ML) (continued) Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	#3 Monterey S 2" Schedule 4 PVC 0.020" sl screen.	0
7FIELD PROGRAMBORI	СС	4-6-8			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.		
CR TREATABILITY TEST	CC	(14)					
NICESIPROJECTS/87600014-NERT-M12WORKING/IN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS.GPJ 9 G	MC	5-5-7 (12)			Sandy SILT, strong brown (7.5YR 5/4), 0/20/80/0, no to low plasticity, fine sand, medium stiff, moist.	≺Hydrated bent chips.	tonite
PROJECTS\87600014-NEF	cc						
	МС	6-6-6 (12)		61		1693.6	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS					Bottom of borehole at 61.5 feet.		
ENVIRONMENTALE							

BORING NUMBER UFMW-02S



CLIEN	Neva	da Environi	mental Resp	onse	Trust	(NERT) F	PROJECT NAME NER	T - AP Area	Treatab	oility Study
PROJ	ECT NUN	IBER 194	-87600012-1	M13		F	PROJECT LOCATION _	Henderson, I	VV	
DATE	STARTE	D 7/14/16		COM	IPLE1	TED 7/25/16	GROUND ELEVATION _	1755.02 ft	но	DLE SIZE 12 in
1			National E			\				
1			ow Stem Au			\				
, I						DBY M. Crews	WATER LEVEL AFTER	DIVILLING ZI	.00 117	LICV 1727.40 IL
2						ated well vault. Well is co-l	ocated as part of a nest	ed well cons	truction	1
-	1					ALCA WON VACIL. WON 10 CO 1	ocated do part of a floor	00 11011 00110	ti dotioi	
O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATER	IAL DESCRIPTION			WELL DIAGRAM Casing Type: Schedule 40 PVC
					7.0	Asphalt. (SM) Silty SAND, yellow to medium sand, loose Cemented fragments. Moderate to strong cen			1754.6	■ Bentonite grout.
10					10.0				<u>1745</u> .0	
	МС	10-15-16 (31)				(SM) Silty SAND, yellowish r medium sand, loose, m	red (5YR 5/6), 10/75/15/noist, few fine gravel.	0, fine to		
. 15	cc									2" Schedule 40 PVC blank casing.
	мс	13-27-30				Silty SAND, yellowish r medium sand, loose, m	ed (5YR 5/6), 10/75/15/noist, few fine gravel.	0, fine to		
	cc	20-50-50					ed (5YR 5/6), 0/80/20/0	, fine to		Hydrated bentonite
i	MC	20-50-50				modium sand, 10050, 11	ioiot.			chip seal.

BORING NUMBER UFMW-02S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJE	ECT NUM	IBER 194	-87600012-	M13	PROJECT LOCATION Henderson, NV		
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
	X	(100)			(SM) (continued)	442	4
25	СС						
	мс	50-50			Silty SAND, yellowish red (5YR 5/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel.		
- <u>-</u>	CC				Ā		#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
					29.0		
20					(ML)		
30	мс	4-7-9 (16)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, moist.		Hydrated bentonite pellets seal.
 	СС				$ar{\Sigma}$		
35					Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to		
	МС	10-10-12 (22)			low plasticity, fine sand, stiff, wet, trace clay.		#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
	CC						Scieen.
40							
	мс	3-5-6 (11)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.		Hydrated bentonite
	СС						1 14

BORING NUMBER UFMW-02S

PAGE 3 OF 3

TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
 -	МС	4-6-8 (14)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1 no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
50	СС					
 	MC	2-5-7 (12)			Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	
- - - 55	CC					
	МС				Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	→ Hydrated bentonite chips.
- 60	СС					
	мс	4-4-8 (12)		61.5	Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	1693.5
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-02I



CLIEN	IT Neva	da Environi	mental Resp	oonse '	Trust	(NERT)	PROJECT NAME NERT - AP Area	Treatab	oility Study
PROJ	ECT NUN	IBER 194	-87600012-	M13			PROJECT LOCATION Henderson, N	٧V	
DATE	STARTE	D _7/14/16		COM	IPLET	ED 7/25/16	GROUND ELEVATION 1755.05 ft	HO	OLE SIZE 12 in
1			National E				WATER LEVEL AT TIME OF DRILLIN	IG 33.0	00 ft / Elev 1722.05 ft
.			ow Stem Au				WATER LEVEL AFTER DRILLING 27	7.68 ft /	Elev 1727.37 ft
	_					M. Crews			
NOTE	S Well of	completed v		24" tra	iffic-ra	ated well vault. Well is co	o-located as part of a nested well cons	truction	l
O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	ERIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4	Asphalt.		1754.7	
						(SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.		
5						Cemented fragments	.		
5						oemented ragments	•		
-					7.0	Moderate to strong c		1748.1	
10					10.0	· ·		1745.1	■Bentonite grout.
	V	10 15 10			10.0	(SM)		.1745.1	
	МС	10-15-16 (31)				medium sand, loose,	n red (5YR 5/6), 10/75/15/0, fine to moist, few fine gravel.		
15	СС								2" Schedule 40 PVC blank casing.
	V	13-27-30				Silty SAND, yellowish	n red (5YR 5/6), 10/75/15/0, fine to moist, few fine gravel.		
	MC	(57)				mediam sand, 1005e,	moiot, low line gravel.		
20	СС								
	МС	20-50-50				Silty SAND, yellowish medium sand, loose,	n red (5YR 5/6), 0/80/20/0, fine to moist.		Hydrated bentonite

BORING NUMBER UFMW-02I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

FROS	LC1 NOI	194-	87600012-	IVIIJ	PROJECT LOCATION Henderson, NV	_
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
2	X	(100)			(SM) (continued)	4444
30 35 40 45 45 45 45 45 45 45 45 45 45 45 45 45	СС				Silty SAND, yellowish red (5YR 5/6), 10/75/15/0, fine to	
	мс	50-50			medium sand, loose, moist, few fine gravel.	
	СС	00 00			▼ 9.0	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
5 -					(ML)	
30					Sandy SILT strong brown (7.5VP 4/6) 0/15/95/0, no to	
	мс	4-7-9			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, moist.	
<u> </u>		(16)				Hydrated bentonite pellets seal.
	СС				abla	
35						
	мс	10-10-12 (22)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to low plasticity, fine sand, stiff, wet, trace clay.	#3 Monterey Sand.
0 10 10 10 10 10 10 10 10 10 10 10 10 10	СС					PVC 0.020" slotted screen.
40						
	мс	3-5-6 (11)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	Hydrated bentonite
						pellets seal.
	СС					
45					(Continued Next Page)	[5-5-5-[4]

BORING NUMBER UFMW-02I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) HTPAO 25	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
45 45 50 55 60	MC	4-6-8 (14)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1 no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
50	CC				Condu CII T. hraum /7 FVD F/4) 0/4 F/0 F/44, no to law	
	MC	2-5-7 (12)			Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	
 55	CC					
	MC				Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	→ Hydrated bentonite chips.
	CC					
_ 60 _	MC	4-4-8 (12)		61.5	Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	1693.6
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-02D



-						rust (NERT)			y Study
- 1			/IBER 194				PROJECT LOCATION Henderson, I		
- 1			D 7/14/16			PLETED _7/25/16			E SIZE 12 in
- 1			ITRACTOR				WATER LEVEL AT TIME OF DRILLIN		
٦I -			HOD Holl				WATER LEVEL AFTER DRILLING 2	7.74 ft / EI	ev 1727.28 ft
χ <u>)</u>		· -	Daniel Kea			Fig. roted well yoult. Well in an	a located as part of a poeted well cope	truction	
	IOTE	yveir	i completed v		24 trail	nc-rated well vault. Well is co	o-located as part of a nested well cons	truction.	
RING LOGS/GINT/ALL M	O UEP'IN	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION	Ca	WELL DIAGRAM asing Type: Schedule 40 PVC
RKINGUN-SITU CK TREATABILITY TESTAFIELD PROGRAMMON	5					Cemented fragments Moderate to strong or		1754.6	
\CES\PROJECTS\87600014-NERT-M12\WOR	10	MC	10-15-16 (31)			10.0 (SM) Silty SAND, yellowish		1745.0	■Bentonite grout.
17 12:49 - \(\text{11S318FS1}\)	- - 15	CC				OW 0 2 2 2 2		//////////////////////////////////////	2" Schedule 40 PVC blank casing.
TD US.GDT - 11/10/	_	МС	13-27-30 (57)			Silty SAND, yellowish medium sand, loose,	n red (5YR 5/6), 10/75/15/0, fine to moist, few fine gravel.	XIIXXIIXX	
ENTAL BH - GINT S	20	CC							
ENVIRON		МС	20-50-50			Silty SAND, yellowish medium sand, loose,	n red (5YR 5/6), 0/80/20/0, fine to moist.	4	Hydrated bentonite

BORING NUMBER UFMW-02D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

PROJ	ECT NUI	MBER _194	-87600012-	·M13		PROJECT LOCATION Henderson, N	1V			
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION				WELL DIAGRAM
	X	(100)				(SM) (continued)		44	4	4
	cc									
	мс	50-50				Silty SAND, yellowish red (5YR 5/6), 10/75/15/0, fine to medium sand, loose, moist, few fine gravel.				
-	MIC	30-30								#3 Monterey Sand. 2" Schedule 40
 	CC				29.0	<u>▼</u> (ML)	1726.0			PVC 0.020" slotted screen.
30									[4]	4
	МС	4-7-9 (16)				Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, moist.				Hydrated bentonite pellets seal.
	cc					<u>⊽</u>				
35										
	МС	10-10-12 (22)			-	Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to low plasticity, fine sand, stiff, wet, trace clay.				#3 Monterey Sand.
 	cc									PVC 0.020" slotted screen.
40						Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/<1, no to		7 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3		Ä
	МС	3-5-6 (11)				low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.			Δ	Hydrated bentonite pellets seal.
 	cc									
45									ŧ	

BORING NUMBER UFMW-02D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(H) (H) 45	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
45 	МС	4-6-8 (14)			(ML) (continued) Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1 no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
50	CC				Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low	
 	MC	2-5-7 (12)			plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	
 55	СС					
	МС				Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	→ Hydrated bentonite chips.
 60	СС					
	МС	4-4-8 (12)			Sandy SILT, brown (7.5YR 5/4), 0/15/85/<1, no to low plasticity, fine sand, medium stiff to stiff, wet, trace clay, cemented nodules.	
				61.	Bottom of borehole at 61.5 feet.	1693.5

BORING NUMBER UFMW-03S

T	F	TETRA TECH, INC.

CLIEN	IT Neva	da Environr	mental Resp	oonse 7	Γrust	(NERT)	PROJECT NAME NERT - AP Area	Treatal	pility Study
1			-87600012-I				PROJECT LOCATION Henderson,		
DATE	STARTE	D 7/13/16		COM	PLET	ED 7/19/13	GROUND ELEVATION 1754.68 ft	н	OLE SIZE 12 in
DRILL	ING CON	ITRACTOR	National E	EWP			WATER LEVEL AT TIME OF DRILLI	ING 30.	00 ft / Elev 1724.68 ft
, l			ow Stem Au				WATER LEVEL AFTER DRILLING	Dry	
j	·-					M. Crews			
NOTE	S Well	completed v	with a 24" x	24" trat	ffic-ra	ated well vault. Well is co	o-located as part of a nested well con-	structior	1.
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4	Asphalt		1754.3	VI VI VI VI
					6.0	(SM) Silty SAND, yel to medium sand, loos	lowish red (5YR 4/6), 10/75/15/0, fine se, moist, few fine gravel.	1748.7	
10					10.0	Moderate to strong o	ementation 6' to 10'.	1744.7	■ Bentonite grout.
	МС	40-38-30 (68)			10.0	(SM) Silty SAND, reddish t coarse sand, fine gra	prown (5YR 5/4), 10/70/20/0, fine to vel, dense, moist, cemented nodules		
15	СС								2" Schedule 40 PVC blank casing.
	МС	17-20-25 (45)				Silty SAND, brown (7 sand, fine gravel, me	.5YR 5/3), 15/70/15/0, fine to coarse dium dense to dense, moist.		
20	CC								Hydrated bentonite
	мс	18-17-19				Silty SAND, brown (7 sand, fine gravel, me	.5YR 5/3), 15/70/15/0, fine to coarse dium dense to dense, moist.		

BORING NUMBER UFMW-03S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

			-07000012-1	VIIIO	PROJECT LOCATION Henderson, NV	-
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	X	(36)			(SM) (continued)	
30 30 40 45	CC					#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
	V	13-14-24			Silty SAND, brown (7.5YR 5/3), 15/70/15/0, fine to coarse sand, fine gravel, medium dense to dense, moist.	
	MC	(38)			1728 (ML)	. <u>7</u>
	СС				Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, very stiff, moist.	Bentonite grout.
						Hydrated bentonite
						pellets seal.
30					extstyle e	
	мс	3-7-14 (21)			no plasticity, fine sand, medium stiff to stiff, wet.	
	Δ	(21)				
-						
						#-#3 Monterey Sand.
-	СС					
35						#-#3 Monterey Sand.
	V	<i>E E 7</i>			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff, wet to saturated.	2" Cobodulo 40
	MC	5-5-7 (12)			plasticity, fine sand, medium stiff, wet to saturated.	PVC 0.020" slotted screen.
						- 10 - 0 - 0 - 0 10
-						
2	CC					
-						
40						
	V _{MC}	5.60			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, hard, wet to saturated.	
= -	MC	5-60			. , , , , , , , , , , , , , , , , , , ,	
						■ Bentonite grout.
-	СС					
						Hydrated bentonite
-						pellets seal.
45						- [6] [4] [4] [4] [4] [4] [4] [4] [4] [4] [4

TETRA TECH, INC.

BORING NUMBER UFMW-03S

PAGE 3 OF 3

CLIENT Nevada Environmental Response Trust (NERT) PROJECT NAME NERT - AP Area Treatability Study **PROJECT NUMBER** 194-87600012-M13 PROJECT LOCATION Henderson, NV ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM ENVIRONMENTAL BH - GINT STD US.GDT - 1/1/10/17 12:49 - I\TTS318FS\CESIPROJECTS\B7600014-NERT-M12\WORKING\IN-SITU CR TREATABILITY TESTFIELD PROGRAM\BORING LOGS\GINTALL M13 LOGS\GPV (ML) (continued) 4-6-8 Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low MC plasticity, fine sand, medium stiff to stiff, wet to saturated. (14)#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted CC screen. 50 Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low 5-8-4 plasticity, fine sand, medium stiff to stiff, wet to saturated. MC (12)CC 55 Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low 8-10-13 plasticity, fine sand, stiff, wet to saturated. МС ◄ Hydrated bentonite (23)chips. CC 60 Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low 6-7-10 plasticity, fine sand, medium stiff to stiff, wet to saturated. MC 61.0 1693.7 (17)(SM) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand, 61.5 1693.2 medium dense, wet. Bottom of borehole at 61.5 feet.

BORING NUMBER UFMW-03I



CLIEN	IT Neva	da Environr	mental Resp	onse Tr	ust (NERT)	PROJECT NAME NER	T - AP Area Trea	tability Study
PROJ	ECT NUM	IBER 194	-87600012-I	M13		PROJECT LOCATION _	Henderson, NV	
DATE	STARTE	D 7/13/16		COMPL	LETED _7/19/13	GROUND ELEVATION	1754.7 ft	HOLE SIZE _12 in
DRILL	ING CON	ITRACTOR	National E	EWP .		WATER LEVEL AT TIME	E OF DRILLING 3	80.00 ft / Elev 1724.70 ft
DRILL	ING MET	HOD Holle	ow Stem Au					
, l		Eric Peirce			KED BY M. Crews		<u> </u>	17 Elov 17 E7 100 K
j	_				c-rated well vault. Well is co	-located as part of a nes	ted well construct	ion.
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
			Ш	0.	4 Asphalt		1754	VI VI VI VI
2					(SM) Silty SAND, yello	owish red (5YR 4/6), 10/ e, moist, few fine gravel.	75/15/0, fine	
5				6.	0		1748	3.7
					Moderate to strong ce	mentation 6' to 10'.	1744	■ Bentonite grout.
	V	40-38-30			(SM) Silty SAND, reddish b	rown (5YR 5/4), 10/70/20	 0/0. fine to	
	СС	(68)				vel, dense, moist, cemen		\$1000000000000000000000000000000000000
[2" Schedule 40 PVC blank casing.
15								
	МС	17-20-25 (45)			Silty SAND, brown (7. sand, fine gravel, med	5YR 5/3), 15/70/15/0, fin dium dense to dense, mo	ne to coarse pist.	
20	CC							A A A A A A A A A A A A A A A A A A A
	MC	18-17-19			Silty SAND, brown (7. sand, fine gravel, med	5YR 5/3), 15/70/15/0, fin dium dense to dense, mo	ne to coarse pist.	

BORING NUMBER UFMW-03I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

SAMPLE TYPE NUMBER NUMB					
	WELL DIAGRAM				
(SM) (continued)					
TOTAL CC CC ## #3 Mo 2" Screen 2" Screen Screen	onterey Sand. hedule 40 0.020" slotted n.				
Silty SAND, brown (7.5YR 5/3), 15/70/15/0, fine to coarse sand, fine gravel, medium dense to dense, moist.					
MC (38) sand, fine graver, medium dense to dense, moist.					
Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, low to ▼ no plasticity, fine sand, very stiff, moist. ■Bento	onite grout.				
CC	ated bentonite s seal.				
Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, medium stiff to stiff, wet.					
CC Sility SAND, brown (7.5YR 5/3), 15/70/15/0, fine to coarse sand, fine gravel, medium dense to dense, moist. 1728,7 172	onterey Sand.				
Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff, wet to saturated.	hedule 40 0.020" slotted				
Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, hard, wet to saturated.	spito gravit				
CC CC Hydra	onite grout. ated bentonite s seal.				
	<i>3</i> 3 C ai.				

BORING NUMBER UFMW-03I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ The DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
G LOGS/GINT/ALL M13	МС	4-6-8 (14)			(ML) (continued) Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet to saturated.	#3 Monterey Sand.
LD PROGRAM/BORIN	СС				Sandy SILT strong brown (7 EVP 4/6) 0/15/95/0 Jow	PVC 0.020" slotted screen.
EATABILITY TEST/FIE	MC	5-8-4 (12)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet to saturated.	
RKINGVIN-SITU CR TR	cc				Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low	
000014-NERT-M12WO	MC	8-10-13 (23)			plasticity, fine sand, stiff, wet to saturated.	→ Hydrated bentonite chips.
1/CES/PROJECTS/876	CC	0.7.40			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low	
TS318FS	MC	6- <i>7</i> -10 (17)			plasticity, fine sand, medium stiff to stiff, wet to saturated. (SM) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand,	1693.7 1693.2
2:49 - //T					medium dense, wet. Bottom of borehole at 61.5 feet.	J
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - NITTS318FS1/CES/PROJECTS/87600014-NERT-M12/WORKING/IN-SITU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINTALL M13 LOGS.GPJ						
ENVIRONMENTAL BH - G						

BORING NUMBER UFMW-03D



CLIEN	NT Neva	da Environi	mental Res _l	ponse Trus	t (NERT)	PROJECT NAME NERT - AP	Area Treatal	pility Study
1			-87600012-			PROJECT LOCATION Hender	•	
1						GROUND ELEVATION 1754.7		
1			National E			WATER LEVEL AT TIME OF DI		
> 			ow Stem Au			WATER LEVEL AFTER DRILLI	NG 27.09 ft	/ Elev 1727.68 ft_
2					D BY M. Crews			
NOTE	S Well	completed v		24" traffic-	rated well vault. Well is co-	located as part of a nested well	construction	<u>1</u>
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATER	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
			Ш	0.4	Asphalt		1754.4	VI VI VI VI
5					(SM) Silty SAND, yello	wish red (5YR 4/6), 10/75/15/0 e, moist, few fine gravel.	, fine	
<u>-</u>				6.0	Moderate to strong cer	mentation 6' to 10'	1748.8	
				10.0			1744.8	■Bentonite grout.
000	мс	40-38-30				rown (5YR 5/4), 10/70/20/0, fine		
	CC	(68)			coarse sand, fine grav	el, dense, moist, cemented noc	dules.	
	1							2" Schedule 40 PVC blank casing.
15	MC	17-20-25 (45)				5YR 5/3), 15/70/15/0, fine to co- ium dense to dense, moist.	arse	
20	СС				Silty SAND, brown (7 !	5YR 5/3), 15/70/15/0, fine to co	arse	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
	MC	18-17-19				ium dense to dense, moist.		4 4 4 4 3 3 3 3

BORING NUMBER UFMW-03D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

PRO	JECT NUN	IBER 194-	-87600012-N	M13	PROJECT LOCATION Henderson, NV	
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
T M 13		(36)			(SM) (continued)	
KAM/BOKING LOGS/GINTAL	cc					#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
180g	V _{MC}	13-14-24			Silty SAND, brown (7.5YR 5/3), 15/70/15/0, fine to coarse sand, fine gravel, medium dense to dense, moist.	
ABILITY TESTAFIELD F	MC CC	(38)			(ML) Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, low to representation of the strong in the st	B.8. ☐ I I I I I I I I I I I I I I I I I I
10 CK IREALY					∇	Hydrated bentonite pellets seal.
ORKING/IN-SI	MC	3-7-14 (21)			Sandy SILT, strong brown (7.5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, medium stiff to stiff, wet.	
-C.1S/87600014-NER1-M12/W	cc					#3 Monterey Sand.
CESNPROJEC	MC	5-5-7 (12)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff, wet to saturated.	2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT ST D US.GD 1 - 11/10/17 12:49 - NITIS318FS7/CES/PROJECT IS8/7600014-NERT-MTZ/WORKING/IN-ST D CK. REATABILITY TEST/HELD PROGRAM/BORING LOGS/GN/TALL M13 L	cc					
STD US.GD	MC	5-60			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, hard, wet to saturated.	Rentonite grout
ENTAL BH - GINT	cc					Bentonite grout.
NONING L	-					A Hydrated bentonite pellets seal.

BORING NUMBER UFMW-03D

PAGE 3 OF 3

TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

LOGS.GPJ 4 DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
LOGS/GINT/ALL M13	MC	4-6-8 (14)			(ML) (continued) Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet to saturated.	#-#3 Monterey Sand.
PROGRAM/BORING	- CC					2" Schedulé 40 PVC 0.020" slotted screen.
ABILITY TEST/FIELD	MC -	5-8-4 (12)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet to saturated.	의 전 수 보다
G\\\N-S\\\T\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	CC					
-NERT-M12/WORKING	MC	8-10-13 (23)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, stiff, wet to saturated.	→ Hydrated bentonite chips.
PROJECTS\87600014	- cc					
8FS1/CES/F	MC	6-7-10 (17)			Sandy SILT, strong brown (7.5YR 4/6), 0/15/85/0, low plasticity, fine sand, medium stiff to stiff, wet to saturated.	.8
NTTS31	<u> </u>	(17)		11:1:1:4	(SM) Silty SAND, white (10YR 8/1), 0/80/20/0, fine sand, medium dense, wet.	
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS1\CES\PROJECTS\R7600014-NERT-M12\WORKING\N-SITU CR TREATABILITY TEST\FIELD PROGRAM/BORING LOGS\GINTALL M13 LOGS\GPJ 1					Bottom of borehole at 61.5 feet.	
ENVIRONMENTAL BH - GIN						

BORING NUMBER UFMW-04S



CLIEN	IT Neva	da Environr	mental Res _l	oonse T	rust (NERT)	PROJECT NAME NER	T - AP Area	Treatabi	ility Study
PROJ	ECT NUM	IBER 194-	-87600012-	M13		PROJECT LOCATION _	Henderson, N	٧V	
DATE	STARTE	D 7/25/16		COM	PLETED 8/4/16	GROUND ELEVATION	1758.79 ft	но	DLE SIZE 12 in
DRILL	ING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME	E OF DRILLIN	IG 31.0	00 ft / Elev 1727.79 ft
1		HOD Holle				WATER I EVEL AFTER	DRILLING 27	 7 75 ft /	Flev 1731 04 ft
· I		Eric Peirce			CKED BY M. Crews	WATER ELVEL ALTER	DIVILLING ZI	.70107	<u> </u>
į l	_				ated well box. Well is co-locat	ted as part of a nested we	ell constructio	n	
	<u> </u>	sompleted t			1100 WOII DOX. WOII 10 00 1000	iou do part or a modeou we	<u> </u>	, TI.	_
O DEPTH	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION			WELL DIAGRAM Casing Type: Schedule 40 PVC
					0.4 Asphalt			1758.4	
5					(SM) Silty SAND, yell to medium sand, loos	owish red (5YR 4/6), 10/7se, moist, few fine gravel.			
					5.5 Moderate to strong or	ementation 5.5' to 10'.		1753.3	
10					10.0			1748.8	■ Bentonite grout.
	МС	4-18-20 (38)			medium sand, mediu	rown (5YR 5/3), 10/70/20/ m dense, moist, little fine	gravel.		
	MC	18-27-39 (66)				rown (5YR 5/3), 10/70/20/ n dense to dense, moist, I	ittle fine	1745.8	
	МС	23-25-30 (55)			(SW) Gravelly SAND 30/60/10/0, fine to co dense, moist.	, reddish brown (5YR 5/3) arse sand, fine gravel, mo), edium		2" Schedule 40 PVC blank casing.
15	MC	15-20-25 (45)			15/65/20/0, fine to co	el, reddish brown (5YR 5 arse sand, fine gravel, mo	/3),	1743.8 1743.3 1743.1	
	МС	10-12-14 (26)			dense, moist. 3" gypsum lense with white (5YR 8/1), trace (SM)	moderate to strong ceme e small gravel.	entation,		
	МС	11-15-17 (32)			Silty SAND, reddish b	prown, (5YR 5/3), 5/70/25, moist, trace fine gravel.	i/0, fine	2 2 2 2	
20	MC	12-16-18 (34)				orown, (5YR 5/3), 5/75/20 , moist, trace fine gravel.	/0, fine	\(\frac{\fin}}}}}}{\frac{\frac{\frac{\frac{\frac{\frac}{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fir}}}}}}}{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fi	Hydrated bentonite chip seal.
				1.1.1.1.		ntinued Next Page)			/ / / / /

BORING NUMBER UFMW-04S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

	101 1101		87600012-M13		PROJECT LOCATION Henderson, NV					
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA GRAPHIC	500	MATERIAL DESCRIPTION				W	ELL DIAGRAM
	МС	7-14-35 (49)			(SM) (continued)	2	Ŋ	4	4	
	МС	8-18-35 (53)			SIIty SAND with Gravel, reddish brown (5YR 4/3), 15/60/25/0, fine to coarse sand, fine gravel, dense, moist.		ν	4	4	
	МС	34-50			3 ,					
_ 25 _	мс	25-50			SIlty SAND with Gravel, reddish brown (5YR 4/3), 20/60/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	+#3 Monterey Sand.
 	МС	7-14-28 (42)			$ar{oldsymbol{arY}}$					- 2" Schedule 40 PVC 0.020" slotted screen.
	мс	7-9-11 (20)		29.0		29.8				
30	MC	40-10-10 (20)			(ML) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low			NAW N	NAWA NAWA	
 	cc				plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		444444	444444	■Hydrated bentonite pellets seal.
30 	MC	4-5-10 (15)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.					⊢#3 Monterey Sand. -2" Schedule 40 PVC 0.020" slotted screen.
	CC								<u> </u>	
<u>40</u> 	МС	3-8-6 (14)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet.		7^4		144444	►Hydrated bentonite pellets seal.
	cc					\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		Δ^{L}	144	
 45					Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace	13 13 13 13				

TETRA TECH, INC.

BORING NUMBER UFMW-04S

PAGE 3 OF 3

PROJECT NAME NERT - AP Area Treatability Study CLIENT Nevada Environmental Response Trust (NERT) **PROJECT NUMBER** 194-87600012-M13 PROJECT LOCATION Henderson, NV ENVIRONMENTAL DATA SAMPLE TYPE NUMBER BLOW COUNTS (N VALUE) GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION WELL DIAGRAM ENVIRONMENTAL BH - GINT STD US.GDT - 1/1/10/17 12:49 - INTS318FS1/CESIPROJECTS/87600014-NERT-M12/WORKINGIN-SITU CR TREATABILITY TESTIFIELD PROGRAM/BORING LOGS/GINTVALL M13 LOGS.GPJ cemented nodules. 5-7-9 (ML) (continued) MC (16)#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen. CC 50 Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no 6-7-12 plasticity, fine sand, soft to medium dense, wet, trace MC (19)cemented nodules. CC 55 Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low ◄ Hydrated bentonite plasticity, fine sand, soft to medium dense, wet, trace 3-4-6 MC chips. (10)cemented nodules. CC 60 Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low 4-4-6 plasticity, fine sand, soft to medium dense, wet, trace MC (10)cemented nodules. 1697.3 Bottom of borehole at 61.5 feet.

BORING NUMBER UFMW-04I



CLIEN	NT Neva	da Environr	mental Resp	oonse Tr	rust (NERT)	PROJECT NAME NERT	Г - AP Area Treata	bility Study
PROJ	ECT NUM	IBER 194-	-87600012-l	M13		PROJECT LOCATION _	Henderson, NV	
DATE	STARTE	D 7/25/16		COMP	LETED _8/4/16	GROUND ELEVATION $_$	1758.84 ft H	OLE SIZE 12 in
DRILL	ING CON	ITRACTOR	National E	EWP		WATER LEVEL AT TIME	OF DRILLING 31.	.00 ft / Elev 1727.84 ft
DRILL	ING MET	HOD Holld	ow Stem Au	ıger		WATER LEVEL AFTER	ORILLING 27.76 ft	/ Elev 1731.08 ft
LOGG	SED BY	Eric Peirce		CHECK	KED BY M. Crews			
NOTE	S Well o	completed v	vith an 18" t	raffic rat	ted well box. Well is co-locat	ed as part of a nested we	Il construction.	
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
			ш	0.	.4 Asphalt		1758.4	VI VI VI VI
5						owish red (5YR 4/6), 10/7 e, moist, few fine gravel.	5/15/0, fine	
				5.	.5		1753.3	
						ementation 5.5' to 10'.		■ Bentonite grout.
10	V	4 10 20		10	0.0 (SM)		1748.8	
	MC	4-18-20 (38)			medium sand, mediu	own (5YR 5/3), 10/70/20/0m dense, moist, little fine	gravel.	
	МС	18-27-39 (66)		1:		own (5YR 5/3), 10/70/20/0 dense to dense, moist, li		
	МС	23-25-30 (55)			(SW) Gravelly SAND, 30/60/10/0, fine to coo dense, moist.	reddish brown (5YR 5/3) arse sand, fine gravel, me	, edium	2" Schedule 40 PVC blank casing.
15	МС	15-20-25 (45)		1	5.0 5.5 (SM) 5.7 Silty SAND with Grav 15/65/20/0, fine to coa	el, reddish brown (5YR 5/ arse sand, fine gravel, me	3), 1743.1 edium	
	мс	10-12-14 (26)			dense, moist. 3" gypsum lense with white (5YR 8/1), trace	moderate to strong ceme		
	МС	11-15-17 (32)				brown, (5YR 5/3), 5/70/25/ moist, trace fine gravel.	70, fine	
_ 20 _	МС	12-16-18 (34)				orown, (5YR 5/3), 5/75/20/ moist, trace fine gravel.	0, fine	Hydrated bentonite chip seal.
				1-1-1-1-1		ntinued Nevt Page)		

BORING NUMBER UFMW-04I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

			-87600012-1		PROJECT LOCATION Henderson, NV		
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
	MC	7-14-35 (49)			(SM) (continued)		44
	МС	8-18-35 (53)			SIlty SAND with Gravel, reddish brown (5YR 4/3), 15/60/25/0, fine to coarse sand, fine gravel, dense, moist.	4 4 4	\(\frac{4}{2}\) \(\frac{1}{2}\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}
 25	МС	34-50					
	МС	25-50			Sllty SAND with Gravel, reddish brown (5YR 4/3), 20/60/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.		#3 Monterey Sand
	мс	7-14-28 (42)			Ā		2" Schedule 40 PVC 0.020" slotter screen.
	МС	7-9-11 (20)			9.0 (ML) (ML) (ML) (ML) (ML) (ML)		
30	МС	40-10-10 (20)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low		
35 - 35 - 40 - 40	cc				plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.		Hydrated bentonite pellets seal.
35	MC	4-5-10 (15)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.		#3 Monterey Sand 2" Schedule 40 PVC 0.020" slotter screen.
40	СС						
- 4 0 	MC	3-8-6 (14)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet.		Hydrated bentonite pellets seal.
 45	cc				Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace		

BORING NUMBER UFMW-04I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ 4 DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
RING LOGS/GINTALL M13	мс	5-7-9 (16)	-		cemented nodules. (ML) (continued)	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS1/CES\PROJECTS\RF000014-NERT-M12W\ORKING\IN-SITU CR_TREATBILITY TEST\FIELD PROGRAM\BORING LOGS\GINT\ALL M13 LOGS\GD\TAL M13 LO	СС	6-7-12 (19)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	
NGNN-SITU CR TREATABILITY	CC					
600014-NERT-M12WORKIN	MC	3-4-6 (10)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	→ Hydrated bentonite chips.
S318FS1\CES\PROJECTS\87	CC MC	4-4-6 (10)	-		Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	1697.3
GDT - 11/10/17 12:49 - NT					Bottom of borehole at 61.5 feet.	
ENTAL BH - GINT STD US.(
ENVIRONME						

BORING NUMBER UFMW-04D



CLIEN	NT Neva	da Environr	mental Res	ponse Trust	(NERT) PI	ROJECT NAME NERT - AP Area	Treatab	oility Study
PROJ	ECT NUM	IBER _194-	-87600012-	M13	PI	ROJECT LOCATION Henderson,	, NV	
DATE	STARTE	D 7/25/16		COMPLET	TED <u>8/4/16</u> G	ROUND ELEVATION 1758.83 ft	но	DLE SIZE 12 in
DRILL	ING CON	ITRACTOR	National E	EWP	W	ATER LEVEL AT TIME OF DRILL	ING 31.0	00 ft / Elev 1727.83 ft
DRILL	ING MET	HOD Holle	ow Stem Au	uger	W	ATER LEVEL AFTER DRILLING	27.73 ft /	Elev 1731.10 ft
LOGG	SED BY _	Eric Peirce		CHECKE	BY M. Crews			
NOTE	S Well o	completed v	vith an 18"	traffic rated	well box. Well is co-located	as part of a nested well construct	ion.	
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIA	AL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
				0.4	Asphalt		1758.4	
5				5.5	(SM) Silty SAND, yellow to medium sand, loose,	rish red (5YR 4/6), 10/75/15/0, fine moist, few fine gravel.	1753.3	
<i>i</i>					Moderate to strong cem-	entation 5.5' to 10'.	1755.5	
10				10.0			1748.8	■Bentonite grout.
	МС	4-18-20 (38)			(SM) Silty Sand, reddish brow medium sand, medium (/n (5YR 5/3), 10/70/20/0, fine to dense, moist, little fine gravel.		
	MC	18-27-39 (66)		13.0		vn (5YR 5/3), 10/70/20/0, fine to ense to dense, moist, little fine	1745.8	
	МС	23-25-30 (55)			(SW) Gravelly SAND, re 30/60/10/0, fine to coars dense, moist.	eddish brown (5YR 5/3), se sand, fine gravel, medium		2" Schedule 40 PVC blank casing.
15	МС	15-20-25 (45)		15.0 15.5 15.7	15/65/20/0, fine to coars	reddish brown (5YR 5/3), se sand, fine gravel, medium	1743.8 1743.3 1743.1	
	MC	10-12-14 (26)			dense, moist. 3" gypsum lense with me white (5YR 8/1), trace si	oderate to strong cementation,		
	МС	11-15-17 (32)			(SM) Silty SAND, reddish brover sand, medium dense, m	wn, (5YR 5/3), 5/70/25/0, fine noist, trace fine gravel.		
20	МС	12-16-18 (34)			Silty SAND, reddish bro sand, medium dense, m	wn, (5YR 5/3), 5/75/20/0, fine noist, trace fine gravel.		Hydrated bentonite chip seal.

BORING NUMBER UFMW-04D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13

11100	ECT NO		-87600012-1	VIIS	PROJECT LOCATION Henderson, NV		
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
	MC	7-14-35 (49)			(SM) (continued)	444	4
	MC	8-18-35 (53)			SIlty SAND with Gravel, reddish brown (5YR 4/3), 15/60/25/0, fine to coarse sand, fine gravel, dense, moist.		
-	МС	34-50					
_ 25	МС	25-50			SIlty SAND with Gravel, reddish brown (5YR 4/3), 20/60/20/0, fine to coarse sand, fine gravel, medium dense to dense, moist.		#3 Monterey Sand.
	МС	7-14-28 (42)			$ar{oldsymbol{\Lambda}}$		2" Schedule 40 PVC 0.020" slotted screen.
	МС	7-9-11 (20)			9.0 1729.	8 B B B B B B B B B B B B B B B B B B B	
30	МС	40-10-10 (20)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low		[4 2 4 5
 	cc				plasticity, fine sand, medium stiff to stiff, moist. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.		Hydrated bentonite pellets seal.
30 	MC	4-5-10 (15)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.		#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
	CC						
_ 40	МС	3-8-6 (14)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet.		Hydrated bentonite pellets seal.
	cc						
45					Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace		

BORING NUMBER UFMW-04D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ 4 DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
RING LOGS/GINTALL M13	мс	5-7-9 (16)	-		cemented nodules. (ML) (continued)	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ENVIRONMENTAL BH - GINT STD US.GDT - 11/10/17 12:49 - \ TTS318FS1/CES\PROJECTS\RF000014-NERT-M12W\ORKING\IN-SITU CR_TREATBILITY TEST\FIELD PROGRAM\BORING LOGS\GINT\ALL M13 LOGS\GD\TAL M13 LO	СС	6-7-12 (19)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	
NGNN-SITU CR TREATABILITY	CC					
600014-NERT-M12WORKIN	MC	3-4-6 (10)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	→ Hydrated bentonite chips.
S318FS1\CES\PROJECTS\87	CC MC	4-4-6 (10)	-		Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, no to low plasticity, fine sand, soft to medium dense, wet, trace cemented nodules.	1697.3
GDT - 11/10/17 12:49 - NT					Bottom of borehole at 61.5 feet.	
ENTAL BH - GINT STD US.(
ENVIRONME						

BORING NUMBER UFMW-05S



1					ust (NERT)	PROJECT NAME NERT - AP Area I		lity Study
1		IBER 194				PROJECT LOCATION Henderson, N		
1					_ETED _8/3/16	GROUND ELEVATION 1758.94 ft	но	LE SIZE 12 in
DRILL	ING CON	ITRACTOR	National	EWP		WATER LEVEL AT TIME OF DRILLIN	IG 30.0	0 ft / Elev 1728.94 ft
DRILL	ING MET	HOD Holle	ow Stem A	uger		WATER LEVEL AFTER DRILLING 27	7.90 ft / l	Elev 1731.04 ft_
LOGG	ED BY	Eric Peirce			KED BY M. Crews			
NOTE	S Well	completed v	with an 18"	traffic rate	ed well box. Well is co-loca	ted as part of a nested well construction	n.	
			7					
	L S	w iii	ENVIRONMENTAL DATA					
E C	BEF	NTS	ME	ا کے ا	NAA TE	TOTAL DECODIDATION		WELL DIA ODAM
DEPTH (ft)	PLE MM	BLOW COUNTS (N VALUE)	SON DA	GRAPHIC LOG	MATE	ERIAL DESCRIPTION		WELL DIAGRAM
	SAMPLE TYPE NUMBER	OZ	N	O				
0	0)		E		1 -		(Casing Type: Schedule 40 PVC
				0.	Compacted base ma		1758.1	
<u> </u>				XX10.	(SM) Silty SAND, ye	llowish red (5YR 4/6), 10/75/15/0, fine	1730.1	
					to medium sand, loo	se, moist, few fine gravel.		
<u>-</u>								
<u>-</u>								
							K	
5								
5							8	
<u>-</u> -				6.			1752.9	
É					Moderate to strong c	ementation 6' to 10'.	K	
<u>-</u>								
								■ Bentonite grout.
10				10	0.0		1748.9	
200	V	20-20-25			(SM)	dish brown (EVD 6/2) E/7E/20/0 fina		
<u>-</u>	MC	(45)			to coarse sand, med	dish brown (5YR 6/3), 5/75/20/0, fine ium dense, moist.	K	
Ž								
[-								
<u> </u>								
-	СС							
=							K	
,								2" Schedule 40 PVC blank casing.
15_								
	V	20 27 27			Silty SAND with Grav	vel, reddish brown (5YR 4/4),	8	
- 1	МС	20-27-27 (54)			dense, moist.	parse sand, fine gravel, medium		
9							K	
3								
2								
<u>-</u>	СС						\$	
5							<u> </u>] [4] [4] [4]
計 -					Silty SAND, reddish	brown (5YR 4/4), 5/70/25/0, fine sand,	1	1 1 1 1 1 1
20					moist, trace fine grav	vel.	\ <u></u>	1 24 24 24
	V					vel, reddish brown (5YR 4/4),	[2	
<u></u> _	MC	12-18-27			20/55/25/0, fine to co	parse sand, no plasticity, fine gravel,		Hydrated bentonite chip seal.

BORING NUMBER UFMW-05S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

			-07000012-			PROJECT LOCATION Heriderson, N				
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION			٧	VELL DIAGRAM
	X	(45)				medium dense, moist.		K4 K4	[4 [.	
35 	СС					(SM) (continued) Silty SAND, reddish brown (5YR 5/3), 10/70/20/0, fine to				
	мс	40-50				coarse sand, dense, moist, little fine gravel, layer with				
	CC	40-50			Ā	moderate to strong cementation.				#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
-						Silty SAND, pinkish gray (5YR 6/2), 10/75/15/0, fine to				
30					30.0 💆	coarse sand, no to low plasticity (silt), moist, little fine gravel.	1728.9			:
	МС	5-10-14 (24)				(ML) Sandy SILT, yellowish red (5YR 4/6), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet, cemented nodules.				4
	СС					Sandy SILT with Gravel, yellowish red (5YR 5/6), 25/25/50/0, no plasticity, fine sand, fine gravel, wet. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine sand, stiff to very stiff, wet, little cemented nodules.				Hydrated bentonite pellets seal.
35						Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low				:
	МС	14-17-17 (34)				plasticity, fine sand, stiff to very stiff, wet, little cemented nodules.				#3 Monterey Sand.
	СС									- 2" Schedule 40 PVC 0.020" slotted screen.
40					40.0		1718.9			:
	МС	3-6-9 (15)				(ML) SILT, yellowish red (5YR 4/6), 0/5/95/0, no plasticity, soft to medium stiff, wet, trace fine sand.				4
	СС				42.0	(ML) Sandy SILT, yellowish red (5YR 4/6), 0/20/80/0, no plasticity, fine sand, wet.	1716.9			Hydrated bentonite pellets seal.
4.5										
45								<u> </u>		1

BORING NUMBER UFMW-05S

PAGE 3 OF 3

TETRA TECH, INC.

CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	4-10-12 (22)			(ML) (continued) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	#3 Monterey Sand.
50	CC				Large cemented nodules, pink (5YR 7/3).	PVC 0.020" slotted screen.
	MC	5-7-11 (18)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	
 	СС					
55 _	MC	5-7-11 (18)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	→ Hydrated bentonite chips.
· -	CC				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	
60 _	MC	3-5-7 (12)		61	Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	1697.4
				61	Bottom of borehole at 61.5 feet.	1697.4

BORING NUMBER UFMW-05I



1	-			•	ust (NERT)	PROJECT NAME NERT - AP Area Tre	
1		IBER 194				PROJECT LOCATION Henderson, NV	
1					_ETED _8/3/16	GROUND ELEVATION 1758.92 ft	HOLE SIZE 12 in
DRILL	ING CON	ITRACTOR	National	EWP		WATER LEVEL AT TIME OF DRILLING	30.00 ft / Elev 1728.92 ft
DRILL	ING MET	HOD Holl	ow Stem A	uger		WATER LEVEL AFTER DRILLING 27.83	2 ft / Elev 1731.10 ft
LOGG	ED BY	Eric Peirce		CHECK	KED BY M. Crews		
NOTE	S Well	completed v	with an 18"	traffic rate	ed well box. Well is co-loca	ted as part of a nested well construction.	
			7				
	/PE	w lil	NT/	O			
H (Ξ Τ` BEF	NI	IME TA	분이	NAATE	TOTAL DECODIDATION	WELL DIACDAM
DEPTH (ft)	1PLI IUM	BLOW COUNTS (N VALUE)	SON	GRAPHIC LOG	IVIATE	ERIAL DESCRIPTION	WELL DIAGRAM
	SAMPLE TYPE NUMBER	02	ENVIRONMENTAL DATA	b			
0			Ш	XXXX		A:	Casing Type: Schedule 40 PVC
MIN				0.	Compacted base ma		58.1
<u> </u>				ĬĬĬ.	(SM) Silty SAND, ye	lowish red (5YR 4/6), 10/75/15/0, fine	
					to medium sand, loo	se, moist, few fine gravel.	
라 -							
5							
5_							
5							
<u>-</u>				6.		ementation 6' to 10'.	52.9
					Wioderate to strong c	ementation o to 10.	
<u> </u>							
							■ Bentonite grout.
<u>+</u>							Bentonite grout.
10				10	0.0		48.9
200	V	20-20-25			(SM) Silty SAND light red	dish brown (5YR 6/3), 5/75/20/0, fine	
ğ	MC	(45)			to coarse sand, med	ium dense, moist.	
<u>ا</u> ا							
	СС						
<u> </u>							2" Schedule 40
64.							PVC blank casing.
15					0111 01115 5		
2	V	20-27-27			Silty SAND with Grav	vel, reddish brown (5YR 4/4), parse sand, fine gravel, medium	
<u>-</u>	MC	(54)			dense, moist.		
6.6							
<u>-</u>							
-							
<u> </u>	СС						\$1 \$1 \$1 \$1
							A A A A
					Silty SAND, reddish	brown (5YR 4/4), 5/70/25/0, fine sand,	74 F4 F4 F4
20					moist, trace fine grav		
	M	12-18-27				vel, reddish brown (5YR 4/4), parse sand, no plasticity, fine gravel,	Hydrated bentonite
	MC	12-10-21			20/33/23/0, fille to co	parse same, no piasucity, line gravel,	chip seal.

BORING NUMBER UFMW-05I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

			-07000012-			PROJECT LOCATION _Heriderson, in				
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION			٧	VELL DIAGRAM
]	X	(45)				medium dense, moist.		1414	[4 [2	
35 	СС					(SM) (continued) Silty SAND, reddish brown (5YR 5/3), 10/70/20/0, fine to				
	мс	40-50				coarse sand, dense, moist, little fine gravel, layer with				
	CC	40-50			Ā	moderate to strong cementation.				-#3 Monterey Sand. -2" Schedule 40 PVC 0.020" slotted screen.
						Silty SAND, pinkish gray (5YR 6/2), 10/75/15/0, fine to				
30					30.0	coarse sand, no to low plasticity (silt), moist, little fine gravel.	1728.9			
 	МС	5-10-14 (24)				(ML) Sandy SILT, yellowish red (5YR 4/6), 0/25/75/0, no to low plasticity, fine sand, medium stiff to stiff, wet, cemented nodules.				
 	СС					Sandy SILT with Gravel, yellowish red (5YR 5/6), 25/25/50/0, no plasticity, fine sand, fine gravel, wet. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine sand, stiff to very stiff, wet, little cemented nodules.				→ Hydrated bentonite pellets seal.
35						Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low				
 	МС	14-17-17 (34)				plasticity, fine sand, stiff to very stiff, wet, little cemented nodules.				#3 Monterey Sand.
 	СС									- 2" Schedule 40 PVC 0.020" slotted screen.
40					40.0		1718.9	E		
	МС	3-6-9 (15)				(ML) SILT, yellowish red (5YR 4/6), 0/5/95/0, no plasticity, soft to medium stiff, wet, trace fine sand.				
 	СС				42.0	(ML) Sandy SILT, yellowish red (5YR 4/6), 0/20/80/0, no plasticity, fine sand, wet.	<u>1716.9</u>			→ Hydrated bentonite pellets seal.
45										
45						(Continued Next Page)				

BORING NUMBER UFMW-05I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

(#) (#)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	4-10-12 (22)			(ML) (continued) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	#3 Monterey Sand
50	СС				Large cemented nodules, pink (5YR 7/3).	PVC 0.020" slotted screen.
 	MC	5-7-11 (18)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet.	
55	CC				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low	
· -	MC	5-7-11 (18)			plasticity, fine sand, medium stiff to stiff, wet. Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace	→ Hydrated bentonite chips.
60	СС				cemented nodules.	
	мс	3-5-7 (12)		61.	Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, no to low plasticity, fine sand, medium stiff to stiff, wet, trace cemented nodules.	1697.4
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-05D



١	CLIEN	T Neva	da Environr	mental Resp	onse Tru	ust (NERT)	PROJECT NAME NER	T - AP Area Treat	ability Study
١	PROJE	ECT NUN	IBER 194	-87600012-1	M13		PROJECT LOCATION _	Henderson, NV	
l	DATE	STARTE	D 7/22/16		COMPL	LETED 8/3/16	GROUND ELEVATION	1758.91 ft	HOLE SIZE 12 in
١	DRILL	ING CON	ITRACTOR	National E	WP		WATER LEVEL AT TIME	OF DRILLING 3	0.00 ft / Elev 1728.91 ft
١	DRILL	ING MET	HOD Holle	ow Stem Au					
٦І						KED BY M. Crews	WATER ELVELATION	<u> </u>	17 216 17 01.10 11
٥l		_				ed well box. Well is co-locat	ted as part of a nested we	ell construction.	
2 -									_
KING LOGS/GIN I WELL IN	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATE	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC
						Compacted base mat	terial.		
	5				6.1	8 (SM) Silty SAND, yell to medium sand, loos	owish red (5YR 4/6), 10/7 se, moist, few fine gravel.	1758 75/15/0, fine	
200	10				10	0.0		1748	
10/01/03/01/03/01		МС	20-20-25 (45)			(SM)	dish brown (5YR 6/3), 5/79 um dense, moist.		-9/1/88/1/1/8/1/1/1/8/1/1/1/8/1/1/1/8/1/1/8/1/1/8/1/1/1/8/1/1/8/1/1/1/8/1/1/1/8/1/1/1/8/1/1/8/1/1/8/1/1/1/8/1/1/1/1/1/8/1/1/1/8/1
/ 12.49 - WI 13310F3 NCE3	15	СС							2" Schedule 40 PVC blank casing.
D 03.6DI - 11/10/1		МС	20-27-27 (54)				el, reddish brown (5YR 4, arse sand, fine gravel, me		
ENTAL BH - GINT ST		СС				Silty SAND, reddish b moist, trace fine grav	orown (5YR 4/4), 5/70/25/ el.	0, fine sand,	
MINORINAID	20	MC	12-18-27			Silty SAND with Grav	el, reddish brown (5YR 4, arse sand, no plasticity, fi		Hydrated bentonite chip seal.

BORING NUMBER UFMW-05D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

TH TYPE SER NO. UE)	
SAMPLE TYPE NUMBER NUMBER NUMBER (It) (It) (It) (It) (It) (It) (It) (It)	WELL DIAGRAM
(45) medium dense, moist. (SM) (continued)	242424
CC CC 25	
Silty SAND, reddish brown (5YR 5/3), 10/70/20/0 coarse sand, dense, moist, little fine gravel, laye	
moderate to strong cementation.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
2	fine to
30.0 coarse sand, no to low plasticity (silt), moist, little	
MC 5-10-14 (24) MC 5-10-14 (24) MC (ML) Sandy SILT, yellowish red (5YR 4/6), 0/25/75/0, plasticity, fine sand, medium stiff to stiff, wet, cer nodules.	no to low emented
Sandy SILT with Gravel, yellowish red (5YR 5/6) 25/25/50/0, no plasticity, fine sand, fine gravel, w Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, plasticity, fine sand, stiff to very stiff, wet, little concodules.	vet. Seal.
35	
MC 14-17-17 (34) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, plasticity, fine sand, stiff to very stiff, wet, little ce nodules.	
	##3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
40 40.0 (ML) SILT, yellowish red (5YR 4/6), 0/5/95/0, no	1718.9 H
MC 3-6-9 (15) MC 3-6-9 (15)	
CC (ML) Sandy SILT, yellowish red (5YR 4/6), 0/20/80/0, plasticity, fine sand, wet.	no Hydrated bentonite pellets seal.
45	

BORING NUMBER UFMW-05D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

Monterey Sanc Schedule 40 C 0.020" slotte een.
C 0.020" slotte
drated bentonit os.

BORING NUMBER UFMW-06S



1	-				ust (NERT)					
1			-87600012-			PROJECT LOCATION Henderson, N				
1					_ETED _8/2/16	GROUND ELEVATION 1758.74 ft	но	DLE SIZE 12 in		
DRILL	ING CON	ITRACTOR	National	EWP		WATER LEVEL AT TIME OF DRILLIN	IG 34.0	34.00 ft / Elev 1724.74 ft		
DRILL	ING MET	HOD Holl	ow Stem A	uger		WATER LEVEL AFTER DRILLING 27	7.56 ft /	Elev 1731.18 ft_		
LOGG	ED BY	Eric Peirce			KED BY M. Crews					
NOTE	S Well	completed v	with an 18"	traffic rate	ed well box. Well is co-loca	ted as part of a nested well construction	n.			
			7							
	/PE	(Q)(I)	TN TN							
TH (1	ET) BEF	N N N	¥E	ا کا	NAATE	TOTAL DECODIDATION		WELL DIA ODAM		
DEPTH (ft)	1PLI IUM	BLOW COUNTS (N VALUE)	DA	GRAPHIC LOG	IVIATE	RIAL DESCRIPTION		WELL DIAGRAM		
_ GEO	SAMPLE TYPE NUMBER	02	ENVIRONMENTAL DATA	0						
0			面	XXXX	Commented have me	to vial		Casing Type: Schedule 40 PVC		
MIN				0.	Compacted base ma		1757.9			
				ĬĬĬ.	(SM) Silty SAND, yel	lowish red (5YR 4/6), 10/75/15/0, fine				
					to medium sand, loos	se, moist, few fine gravel.				
라 -										
							K			
5_										
5							8			
- - -				6.	Moderate to strong c		1752.7			
					Woderate to strong c	ementation o to ro.				
<u> </u>							K			
								■ Bentonite grout.		
<u> </u>								a a bentonite grout.		
10				10	0.0		<u>1748.7</u>			
70/0	V				(SM) Silty SAND with Gray	vel, reddish brown (5YR 5/3),				
<u>-</u>	MC	23-50			25/55/20/0, fine to co	parse sand, fine to medium gravel,	K			
<u>ا</u> ا					moist.		8			
							8			
	СС									
								2" Schedule 40		
64.								PVC blank casing.		
15					0111 01115 111 5					
2	V	25-25-30				vel, reddish brown (5YR 5/3), parse sand, fine to medium gravel,	K			
<u>-</u>	MC	(55)			moist.	g.a.a,e tooaia g.a.o.,				
0.0										
<u>-</u>					Silty SAND, reddish	brown (5YR 5/3), 0/85/15/0, fine to	8			
-					medium sand, moist.					
<u> </u>	СС						Ĭ,	[]		
							<u> </u>			
							2	4 24 24 24		
20							5,	4 A A A		
	M				Silty SAND with Grav	vel, reddish brown (5YR 5/3), edium sand, no plasticity, fine gravel,	[,	Hydrated bentonite		
	MC	5			10/10/10/0, IIIIe to III	Calam Sana, no plasticity, litte graver,		chip seal.		

BORING NUMBER UFMW-06S

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

DЕРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION	V	/ELL DIAGRAM
	СС					moist. (SM) (continued) Silty SAND, dark reddish brown (5YR 3/3), 10/75/15/0, fine to medium sand, fine gravel, moist, poorly graded.		
25	МС	14-28-50 (78)			25.0	(SW) SAND, dark reddish brown (5YR 3/3), 10/85/5/0, fine to coarse sand, fine gravel, moist, well graded.	733.7	←#3 Monterey Sand.
 	CC				28.0	(SM) Silty SAND, dark reddish brown (5YR 3/3), 10/75/15/0, fine to coarse sand, moist, little fine gravel.	730.7	- 2" Schedule 40 PVC 0.020" slotted screen.
30	МС	5-5-5 (10)			30.0	(ML) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, moist.	728.7	■Hydrated bentonite
	СС				-	$ar{ abla}$		pellets seal.
35	МС	7-11-12 (23)				Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet.		
40	СС					Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet, some coarse gravel. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet.		#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
40	МС	7-10-13 (23)				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet.		
 	СС							→ Hydrated bentonite pellets seal.
45						(Continued Next Page)		

TETRA TECH, INC.

BORING NUMBER UFMW-06S

PAGE 3 OF 3

 CLIENT
 Nevada Environmental Response Trust (NERT)
 PROJECT NAME
 NERT - AP Area Treatability Study

 PROJECT NUMBER
 194-87600012-M13
 PROJECT LOCATION
 Henderson, NV

(ft) (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA GRAPHIC	500	MATERIAL DESCRIPTION	WELL DIAGRAM
	МС	3-7-15 (22)			(ML) (continued) Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet, few cemented nodules.	#3 Monterey Sand
50	CC					PVC 0.020" slotted screen.
	MC	3-5-7 (12)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine to coarse sand, wet, few cemented nodules.	
	CC				Sandy SILT, yellowish red (5YR 5/6), 0/25/75/0, low plasticity, fine sand, wet, few cemented nodules.	
55	MC	7-9-12 (21)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine to coarse sand, wet, few cemented nodules.	≺Hydrated bentonite chips.
· -	CC					
60	мс	3-7-10 (17)		61.5		97.2
					Bottom of borehole at 61.5 feet.	

BORING NUMBER UFMW-06I



CLIEN	Neva	da Environi	mental Resp	onse -	se Trust (NERT) PROJECT NAME NERT - AP Area Treata				reatab	ility Study		
PROJ	ECT NUM	IBER 194	-87600012-1	M13			PROJECT LOCATION _	Henderson, N	IV			
DATE	STARTE	D 7/22/16	<u> </u>	СОМ	PLET	ED 8/2/16	GROUND ELEVATION	1758.71 ft	нс	DLE SIZE 12 in		
DRILL	ING CON	ITRACTOR	National E	WP			WATER LEVEL AT TIME	OF DRILLING	G 34.0	00 ft / Elev 1724.71 ft		
DRILL	ING MET	HOD Holle	ow Stem Au	ıger			WATER LEVEL AFTER I					
- I						BY M. Crews	WATER ELVELATION	<u> </u>	.40 167	<u> </u>		
[_						ted as part of a nested we	ell construction	٦.			
O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATE	RIAL DESCRIPTION			WELL DIAGRAM Casing Type: Schedule 40 PVC		
						Compacted base ma	terial.					
5					0.8	(SM) Silty SAND, yel	lowish red (5YR 4/6), 10/7 se, moist, few fine gravel.		1757.9			
<u>}</u> -					6.0			1	1752.7			
						Moderate to strong or	ementation 6 to 10.			■Bentonite grout.		
10					<u>10.0</u>	(SM)		1	<u>1748.7</u>			
	мс	23-50				Silty SAND with Grav	el, reddish brown (5YR 5/ arse sand, fine to mediun	/3), n gravel,				
15	СС									2" Schedule 40 PVC blank casing.		
	МС	25-25-30 (55)					el, reddish brown (5YR 5/ arse sand, fine to mediun					
20	cc					Silty SAND, reddish t medium sand, moist.	orown (5YR 5/3), 0/85/15/	0, fine to				
	мс	5				Silty SAND with Grav 15/70/15/0, fine to me	rel, reddish brown (5YR 5/ edium sand, no plasticity,	/3), fine gravel,		Hydrated bentonite chip seal.		

BORING NUMBER UFMW-06I

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

			7							
DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION			١	WELL DIAGRAM
	X					moist. (SM) <i>(continued)</i>				7/
30 	CC					Silty SAND, dark reddish brown (5YR 3/3), 10/75/15/0, fine to medium sand, fine gravel, moist, poorly graded.				
25	V	44.00.50			25.0	(SW) SAND, dark reddish brown (5YR 3/3), 10/85/5/0, fine	1733.7			
	MC	14-28-50 (78)		*****		to coarse sand, fine gravel, moist, well graded.				
										#3 Monterey Sand.
				*****	28.0	<u>I</u>	1730.7		*	2" Schedule 40 PVC 0.020" slotted
	CC				20.0	(SM) Silty SAND, dark reddish brown (5YR 3/3), 10/75/15/0, fine to coarse sand, moist, little fine gravel.	1700.7			screen.
-						10/10/10/0, line to occide saint, molet, little line gravel.				
30					30.0	(MIX	1728.7			
	мс	5-5-5 (10)				(ML) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, moist.				γ Σ
	Δ	(10)				plasticity, file sailu, filoist.				<u> </u>
									4	Hydrated bentonite pellets seal.
	СС									7 Powers coam
					Z	Z		Ϋ́		\ \ \ \
25										
35	V	7 44 40				Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no				
	MC	7-11-12 (23)				plasticity, fine sand, wet.				
										- +-#3 Monterey Sand.
						Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet, some coarse gravel.				2" Schedule 40
	СС					Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet.				PVC 0.020" slotted screen.
						pidototy, fine saira, wet.				
40						0 1 00 7				
	MC	7-10-13				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet.				\ \ \ \
		(23)						\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		
										Hydrated bentonite pellets seal.
										yellets seal.
	CC							ΥΥΥ Α Α Α		
								F^→^ 		[1]
45										

BORING NUMBER UFMW-06I

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

LOGS.GPJ 4 DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
INCES/PROJECTS/87600014-NERT-M12/WORKING/IN-S/TU CR TREATABILITY TEST/FIELD PROGRAM/BORING LOGS/GINT/ALL M13 LOGS.GPJ	мс	3-7-15 (22)			(ML) (continued) Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet, few cemented nodules.	#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
ABILITY TESTAFIELD PROGRA	MC	3-5-7 (12)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine to coarse sand, wet, few cemented nodules. Sandy SILT, yellowish red (5YR 5/6), 0/25/75/0, low	
ORKINGIN-SITU CR TREATA	СС	7-9-12			plasticity, fine sand, wet, few cemented nodules.	
ECTS\87600014-NERT-M12\W	мс	(21)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine to coarse sand, wet, few cemented nodules.	→ Hydrated bentonite chips. - The chips is a second of the chips is a second or chips i
	MC	3-7-10 (17)		64	Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine to coarse sand, wet, few cemented nodules Bottom of borehole at 61.5 feet.	. 1697.2
ENVIRONMENTAL BH - GINT STD US, GDT - 11/10/17 12:49 - \(\text{TTS318FS}\)						
ONMENTAL BH - GINT STI						

BORING NUMBER UFMW-06D



١	CLIEN	IT Neva	ıda Environi	mental Resp	oonse Trus	(NERT) PROJECT NAME NERT - AP Area Treatability Study					
	PROJ	ECT NUM	/IBER _194	-87600012-	M13		PROJECT LOCATION	Henderson, NV			
	DATE	STARTE	D 7/22/16		COMPLE	ETED _8/2/16	GROUND ELEVATION	1758.76 ft	HOLE SIZE 12 in		
			NTRACTOR								
			THOD Holle				WATER LEVEL AFTER DRILLING 27.56 ft / Elev 1731.20 ft				
2			Eric Peirce	DITIELING 27.50	117 LIGV 1731.2011						
ġ						d well box. Well is co-locate	ed as part of a nested we	ell construction			
								0 000 00			
ING LOGS/GIN I WELL IN	O DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATEI	RIAL DESCRIPTION		WELL DIAGRAM Casing Type: Schedule 40 PVC		
						Compacted base mate	erial.				
WORKING III - SI IO ON TREATABLETT TEST THEED TROOPAINTE	5				6.0	(SM) Silty SAND, yello	owish red (5YR 4/6), 10/e, moist, few fine gravel.	175/ 75/15/0, fine			
1/CE3/PROJECT3/6/ 6000 14-IVERT -IVI 12	10	МС	23-50		10.0	(SM) Silty SAND with Grave	– – – – – – – el, reddish brown (5YR 5 arse sand, fine to mediur	<u>_ 174</u> 5/3), n gravel,	Bentonite grout.		
12.49 = WI ISSIONS	 15	СС							2" Schedule 40 PVC blank casing.		
US.GDI = 11/10/11		МС	25-25-30 (55)			Silty SAND with Grave 25/55/20/0, fine to coa moist.	el, reddish brown (5YR 5 arse sand, fine to mediur	i/3), m gravel,			
MENIAL BH - GINI SID		CC				Silty SAND, reddish b medium sand, moist.	rown (5YR 5/3), 0/85/15/	/0, fine to			
NO PLANT		мс	5			Silty SAND with Grave 15/70/15/0, fine to me	el, reddish brown (5YR 5 dium sand, no plasticity,	5/3), , fine gravel,	Hydrated bentonite chip seal.		

BORING NUMBER UFMW-06D

PAGE 2 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER 194-87600012-M13 PROJECT LOCATION Henderson, NV

DЕРТН (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG		MATERIAL DESCRIPTION		WELL DIAGRAM
	X		Ш			moist. (SM) (continued)		
 25	CC				25.0		1733.8	
 	МС	14-28-50 (78)				(SW) SAND, dark reddish brown (5YR 3/3), 10/85/5/0, fine to coarse sand, fine gravel, moist, well graded.		+#3 Monterey Sand.
 	СС				28.0	(SM) Silty SAND, dark reddish brown (5YR 3/3), 10/75/15/0, fine to coarse sand, moist, little fine gravel.	1730.8 1728.8	2" Schedule 40 PVC 0.020" slotted screen.
	МС	5-5-5 (10)			30.0	(ML) Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, moist.	1720.0	A A A Hydrated bentonite
 35	CC				∇	7_		pellets seal.
	МС	7-11-12 (23)				Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet.		
	CC					Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet, some coarse gravel. Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low to no plasticity, fine sand, wet.		#3 Monterey Sand. 2" Schedule 40 PVC 0.020" slotted screen.
40	МС	7-10-13 (23)				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet.		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
 	CC							A Hydrated bentonite pellets seal.
45						(Continued Next Page)		

BORING NUMBER UFMW-06D

PAGE 3 OF 3



CLIENT Nevada Environmental Response Trust (NERT)

PROJECT NAME NERT - AP Area Treatability Study

PROJECT NUMBER <u>194-87600012-M13</u>

PROJECT LOCATION Henderson, NV

(ft) (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
	MC	3-7-15 (22)			(ML) (continued) Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine sand, wet, few cemented nodules.	#3 Monterey Sand.
 50	СС				Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low	PVC 0.020" slotted screen.
	МС	3-5-7 (12)			plasticity, fine to coarse sand, wet, few cemented nodules.	
45 45 50 55 60	CC				Sandy SILT, yellowish red (5YR 5/6), 0/25/75/0, low plasticity, fine sand, wet, few cemented nodules.	
55	MC	7-9-12 (21)			Sandy SILT, yellowish red (5YR 5/6), 0/15/85/0, low plasticity, fine to coarse sand, wet, few cemented nodules.	→ Hydrated bentonite chips.
	CC					
	мс	3-7-10 (17)			Sandy SILT, yellowish red (5YR 5/6), 0/20/80/0, low plasticity, fine to coarse sand, wet, few cemented nodules.	4007.0
				61.	Bottom of borehole at 61.5 feet.	1697.3

Appendix C Aquifer Testing Results Technical Memorandum

Biological Reduction Study



TECHNICAL MEMORANDUM

To:	Arul Ayyaswami, Tetra Tech
Cc:	Carl Lenker and Mike Crews, Tetra Tech
From:	Sonya Cadle, Chris Gutmann, and Ellyn Swenson, Tetra Tech
Date:	November 1, 2017
Subject:	Aquifer Testing Results – In-Situ Chromium Treatability Study

1.0 INTRODUCTION

This technical memorandum presents the results of the aquifer slug testing and specific capacity tests performed as part of the NERT In-Situ Chromium Treatability Study hydrogeological evaluation. The slug tests were conducted in the deep ("D") wells, since there was insufficient water in the shallow ("S") wells to permit slug testing. Specific capacity tests were conducted in both shallow and deep wells and used to provide supplemental estimates of aquifer parameters.

The locations of the wells are shown below. The objective of the aquifer slug and pump testing was to estimate aquifer hydraulic conductivity (K) in the study area before injection testing. Because the shallow alluvial wells had extremely small saturated thicknesses (often less than a foot), the aquifer parameter estimates were extremely dependent on the exact saturated thickness. Hence, these estimates were not considered representative of the overall K of the alluvium but proved useful in estimating potential injection rates. Selected wells were also tested after the injection was completed to assess whether the injections affected hydraulic conductivity.

2.0 SLUG TESTS

Slug testing was performed in February, April, and October/November 2017. Well construction information is provided in Table 1. The tests consisted of monitoring water level displacements caused by the insertion or removal of a solid slug from a well. Water level displacement was measured using a Solinst Levelogger Gold M5 pressure transducer, which was programmed to collect data at one-half second time intervals. When the rate of recovery allowed multiple tests, several tests were performed at each well. The size of the slug was selected to be consistent with the diameter of the well.

The slug test data were downloaded from the transducer and the drawdown was calculated from the downloaded data. Several slug tests were selected for analysis from each well. Slug test analysis was performed using the

Tetra Tech, Inc.

commercially-available AQTESOLV software (HydroSOLVE 2007). The Bouwer and Rice (1976) method for analyzing slug tests in an unconfined aquifer was used to estimate hydraulic conductivity. The AQTESOLV interpretation plots are provided as Attachment A. Table 2 summarizes the results of the slug test analysis; the K values provided for each well represent a mean of the K estimates obtained from individual tests at that well. Water levels measured during the testing events are summarized in Table 3.

All tested wells were screened in the Upper Muddy Creek Formation (UMCf). The estimated Ks are generally consistent with the logged lithology of the screened interval of the wells, which was primarily silt to sandy silt. Prior estimates of the hydraulic conductivity for the UMCf have ranged from less than 0.01 feet per day (ft/day) to more than 10 ft/day. The estimates from the In-Situ Chromium Treatability Study area slug tests ranged from about 0.2 to 3 ft/day, which is consistent with the previous range.

Many factors can affect slug test results. In considering whether the K from a slug test is representative of the overall formation K, the values estimated from slug tests are strongly influenced by factors such as a low-K well skin, drilling-induced disturbances, highly anisotropic formations, and the quality of well development (Butler 1998, Hyder and Butler 1995). Other possible factors could include non-instantaneous or incomplete slug removal, accidental transducer or slug movement after the test began, and others. However, in general, the individual slug tests analyzed were very consistent within each well.

3.0 SPECIFIC CAPACITY TESTS

Specific capacity tests were performed in shallow wells as well as some deep wells. Each well was pumped for 20-30 minutes at a low flow rate and then allowed to recover. Most tests were analyzed using the Theis (1935) method or the Hantush-Jacob (1955) leaky aquifer solution. Table 4 presents the estimated hydraulic conductivity for each of the specific capacity tests.

Because specific capacity tests are not commonly used to estimate K, the specific capacity K estimates in the deeper wells were compared to the corresponding slug test K estimates from the same wells. The results were quite similar, as a quick comparison of Tables 2 and 4 will confirm. However, the specific capacity test results from the shallow wells are likely to be heavily influenced by saturated thickness, since less than two feet of saturated thickness exists in the shallow wells. For example, if the saturated interval of a well consists of a 5-inch sand stringer underlain by primarily silt, then decreasing the saturated thickness by only a few inches would significantly decrease the well's production capacity and hence the estimated K. This may be what happened to wells CTMW-01S and CTMW-02S when the saturated thickness decreased by about half a foot between April and October 2017. The wells' production capacity decreased so significantly that they quickly went dry, even when pumped at a much lower rate.

4.0 COMPARISON BEFORE AND AFTER INJECTIONS

Treatability study-related injections began after the April 2017 aquifer testing event was completed. Several wells were tested in October/November 2017 after all injections were completed in order to assess whether the injections had potentially influenced K. The K estimates from the pre-injection (December 2016 and April 2017) and post-injection (October/November 2017) tests are provided in Table 2.

The comparison of aquifer test results before and after treatability study-related injections showed that most wells experienced no significant changes between the K estimates before and after injection occurred. There were several exceptions:

Well CTIW-02D experienced a decrease in K of approximately one order of magnitude between the April
and November 2017 slug tests. Because well CTIW-02D was used for injection, well fouling is a possible
cause for the K change.

 Wells CTMW-01S and CTMW-02S also experienced significant decreases in K. However, as discussed in the prior section, the decrease in saturated thickness between the two tests may be the cause of this change.

5.0 REFERENCES

- Bouwer, H. and Rice, R.C., 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research*, vol. 12, no. 3, pp. 423-428.
- Butler, James J. Jr., 1998. The Design, Performance, and Analysis of Slug Tests., CRC Press LLC, 252 pages.
- Hantush, M.S., 1960. Modification of the theory of leaky aquifers, Jour. of Geophys. Res., vol. 65, no. 11, pp. 3713-3725.
- Hantush, M.S. and C.E. Jacob, 1955. Non-steady radial flow in an infinite leaky aquifer, Am. Geophys. Union Trans., vol. 36, pp. 95-100.
- Hyder, Z. and Butler, J.J. Jr., 1995. Slug tests in unconfined formations: an assessment of the Bouwer and Rice technique, Ground Water, vol. 33, no. 1, pp. 16-22.
- HydroSOLVE, Inc., 2007. AQTESOLV version 4.50 Professional. Developed by Glenn M. Duffield
- Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524

Table 1: Well Construction Information
In-Situ Chromium Treatability Study, Henderson, Nevada

Well ID	UMCf	Screened	Screen Length	Top of	Well	Slug Dime	ensions
	Contact (feet bgs)	Interval (feet bgs)	(feet)	Casing (feet amsl)	Diameter (inches)	Diameter (inches)	Length (feet)
CTIW-01S	23.5	18.5 - 23.5	5	1,757.41	2		
CTIW-01D	23.5	33 - 38	5	1,757.34	2	1.66	5
CTIW-02S	24	19 - 24	5	1,757.45	2	-	
CTIW-02D	24	34 - 49	15	1,757.31	2	1.66	5
CTIW-03S	24	19 - 24	5	1,757.32	2		
CTIW-03D	24	34 - 49	15	1,757.48	2	1.66	5
CTMW-01S	24	19 - 24	5	1,757.16	2		
CTMW-01D	24	34 - 49	15	1,757.14	2	1.66	5
CTMW-02S	24	19 - 24	5	1,757.21	2		
CTMW-02D	24	34 - 49	15	1,757.26	2	1.66	5
CTMW-03S	24	19 - 24	5	1,757.21	2		
CTMW-03D	24	34 - 39	5	1,757.23	2	1.66	5
CTMW-04S	24	19 - 24	5	1,757.00	2		
CTMW-04D	24	34 - 49	15	1,757.00	2	1.66	5
CTMW-05S	24	19 - 24	5	1,757.24	2		
CTMW-05D	24	34 - 54	20	1,757.25	2	1.66	5
CTMW-06S	24	19 - 24	5	1,757.43	2		
CTMW-06D	24	34 - 54	20	1,757.42	2	1.66	5

Shallow "S" wells were not tested because the saturated thickness was too small to support slug

bgs - below ground surface

amsl - above mean sea level

UMCf - Upper Muddy Creek Formation

Table 2: Slug Test Results
In-Situ Chromium Treatability Study, Henderson, Nevada

Well	Date	Mean Hydraulic Conductivity		Logged Lithology of Screened Interval
		(feet/day)	(cm/sec)	
CTIW-01D	12/9/2016	1.4	5.00E-04	Silt
CHW-01D	10/31/2017	0.9	3.03E-04	Silt
CTIW-02D	4/10/2017	1.0	3.42E-04	Silt
CTIVV-02D	11/1/2017	0.1	3.05E-05	Silt
CTIW-03D	4/10/2017	0.3	1.23E-04	Silt
CIIW-03D	11/1/2017	0.4	1.24E-04	Silt
CTMW-01D	4/10/2017	0.5	1.94E-04	Silt
CTIVIVV-01D	10/4/2017	0.7	2.49E-04	Silt
CTMW-02D	4/10/2017	0.6	2.03E-04	Silt
CTIVIVV-02D	10/4/2017	0.5	1.79E-04	Silt
CTMW-03D	12/9/2016	2.5	9.00E-04	Silt
CTIVIVV-03D	10/5/2017	3.1	1.10E-03	Silt
CTMW-04D	4/10/2017	1.1	3.93E-04	Silt
C110100-04D	10/5/2017	1.3	4.42E-04	Silt
CTMW-05D	10/5/2017	1.5	5.12E-04	Silt
CTMW-06D	10/4/2017	1.0	3.59E-04	Silt

cm/sec - centimeters per second

Table 3: Water Levels
In-Situ Chromium Treatability Study, Henderson, Nevada

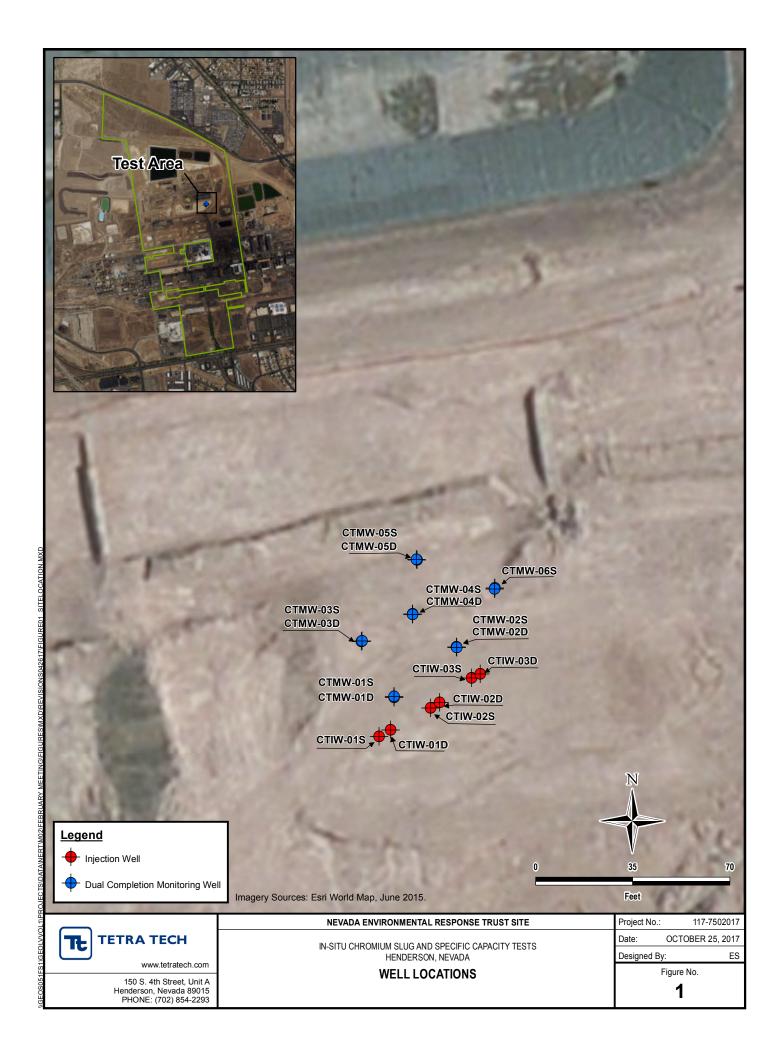
Well ID	Date	Total Depth (feet btoc)	Water Level (feet btoc)
	12/7/2016	23.55	22.77
CTIW-01S	2/28/2017	23.55	21.94
	4/3/2017	23.20	22.26
	12/7/2016	38.00	22.79
CTIW-01D	2/28/2017	38.00	21.89
CHW-01D	4/3/2017	37.80	22.21
	10/31/2017	37.80	22.57
CTIW-02S	4/3/2017	23.60	22.49
CTIW-02D	4/3/2017	48.40	22.52
CTTVV-02D	11/1/2017	48.40	22.92
CTIW-03S	4/3/2017	23.50	22.53
CTIW-03D	4/3/2017	48.60	22.8
CIIVV-03D	11/1/2017	48.60	23.44
CTMW-01S	4/3/2017	23.50	22.21
CHVIVV-013	10/10/2017	25.00	22.68
CTMANA OAD	4/3/2017	48.50	22.37
CTMW-01D	10/4/2017	49.20	22.9
CTMW-02S	4/3/2017	23.40	22.47
CTIVIVV-023	10/10/2017	25.00	23.25
CTMANA ORD	4/3/2017	48.40	22.72
CTMW-02D	10/4/2017	49.18	23.38
	12/7/2016	24.05	23.04
CTN 4VA / COC	2/28/2017	24.05	22.17
CTMW-03S	4/3/2017	23.60	22.36
	10/9/2017	25.00	22.74
	12/7/2016	39.50	23.1
CTN AVA / COD	2/28/2017	39.50	22.25
CTMW-03D	4/3/2017	38.60	22.43
	10/5/2017	25.00 23.25 48.40 22.72 49.18 23.38 24.05 23.04 24.05 22.17 23.60 22.36 25.00 22.74 39.50 23.1 39.50 22.25 38.60 22.43 39.49 22.87 23.30 22.37	
CTN 414 C 4 C	4/3/2017		
CTMW-04S	10/9/2017	25.00	22.95
CTN ANALOGAE	4/3/2017	48.30	22.62
CTMW-04D	10/5/2017	48.99	23.14
CTMW-05S	10/9/2017	25.00	23.38
CTMW-05D	10/5/2017	54.00	23.55
CTMW-06S	10/9/2017	25.00	23.65
CTMW-06D	10/4/2017	55.00	23.99

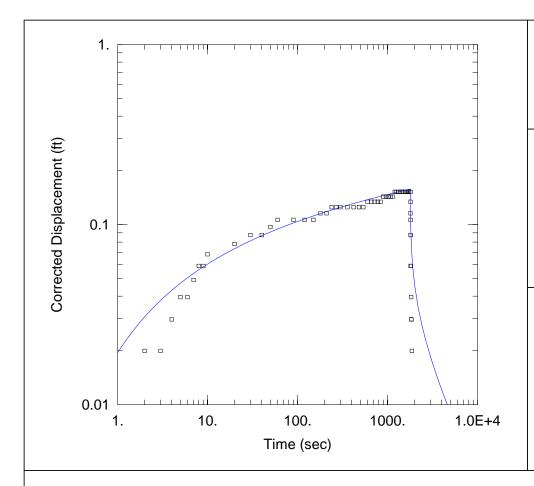
btoc - below top of casing

	Table 4: Specific Capacity Test Test Results In-Situ Chromium Treatability Study, Henderson, Nevada										
Well	Date	Analysis Type	Flow Rate (L/min)	Saturated Thickness (feet)	Estimated (feet/day)	Hydraulic (cm/sec)	Logged Lithology of Screened Interval				
070110	- / / /	Theis, Unconfined	0.50	1.24	61	2.15E-02					
CTIW-01S	2/28/2017	Theis, Unconfined	0.75	1.24	61	2.17E-02	Silty sand with gravel				
OTUM OAD	2/28/2017	Theis, Confined	1.50	6.00	1.5	5.43E-04	0.11				
CTIW-01D	4/7/2017	Theis, Confined	3.00	6.00	1.0	3.59E-04	Silt				
CTIW-02S	4/6/2017	Theis, Unconfined	1.20	1.51	30	1.05E-02	Well graded sand to silty sand				
CTIW-02D	4/7/2017	Theis, Confined	0.70	16.00	0.6	2.23E-04	Silt				
CTIW-03S	4/6/2017	Theis, Unconfined	1.00	1.47	53	1.87E-02	Well graded sand to silty sand				
CTIW-03D	4/7/2017	Theis, Confined	0.50	16.00	0.2	6.65E-05	Silt				
CTMW-01S	2/28/2017	Theis, Unconfined	1.00	1.79	15	5.12E-03	Mall graded conducith silt				
CTIVIVV-015	10/10/2017	Bouwer-Rice, Slug Test*	0.20	1.32	0.41	1.45E-04	Well graded sand with silt				
CTMW-01D	4/7/2017	Theis, Confined	0.30	16.00	0.5	1.92E-04	Silt				
CTMW-02S	4/6/2017	Theis, Unconfined	0.70	1.53	27	9.39E-03	Well graded sand with silt and gravel				
C110100-023	10/10/2017	Bouwer-Rice, Slug Test*	0.10	0.75	0.51	1.80E-04	vveii graded sand with siit and graver				
CTMW-02D	4/7/2017	Theis, Confined	0.75	16.00	0.4	1.41E-04	Silt				
CTMW-03S	2/28/2017	Theis, Unconfined	0.50	1.64	75	2.64E-02	Silty sand with gravel				
CTMW-03S	10/9/2017	Theis, Unconfined	1.00	1.26	134	4.71E-02	Silty sand with interbedded sand with				
C110100-033	10/9/2017	Hantush-Jacob, Leaky	1.00	1.26	123	4.34E-02	gravel				
CTMW-03D	2/28/2017	Theis, Confined	2.00	6.00	3.0	1.05E-03	Silt with fine to coarse grained sand and gravel				
CTMW-04S	4/7/2017	Theis, Unconfined	1.00	1.63	34	1.20E-02	Wall graded aand to silty aand				
C110100-045	10/9/2017	Hantush-Jacob, Leaky	0.50	1.05	22.8	8.05E-03	Well graded sand to silty sand				
CTMW-04D	4/7/2017	Theis, Confined	0.50	16.00	0.4	1.28E-04	Silt				
CTMW-05S	10/9/2017	Theis, Unconfined	0.50	0.62	46	1.61E-02	Well graded sand				
C110100-053	10/3/2017	Hantush-Jacob, Leaky	0.50	0.62	27	9.58E-03	vveii graded Sand				
CTMW-06S	10/9/2017	Theis, Unconfined	0.50	0.35	119.5	4.22E-02	Well graded sand				
C110100-00S	10/8/2017	Hantush-Jacob, Leaky	0.50	0.35	90.6	3.20E-02	vveii graded sand				

cm/sec - centimeters per second

* Test analyzed as a slug test because the well went dry very quickly





PUMPING TEST FOR CTIW-01S (0.5 L/MIN)

Data Set: T:\...\CTIW-01S.aqt

Date: 05/01/17 Time: 16:05:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-01S
Test Date: 2/28/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Theis

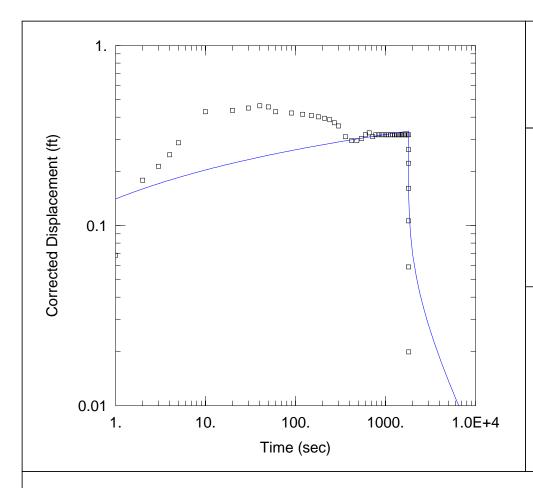
 $T = 98.16 \text{ ft}^2/\text{day}$

S = 0.0114

Kz/Kr = 0.1

 $b = \overline{1.61} \text{ ft}$

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTIW-01S	0	0	□ CTIW-01S	0	0	
		•			•	



Dumping Walls

PUMPING TEST FOR CTIW-01S, 0.75L/MIN

Data Set: T:\...\CTIW-01S 0.75.aqt

Date: 05/02/17 Time: 14:23:09

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-01S
Test Date: 2/28/2017

SOLUTION

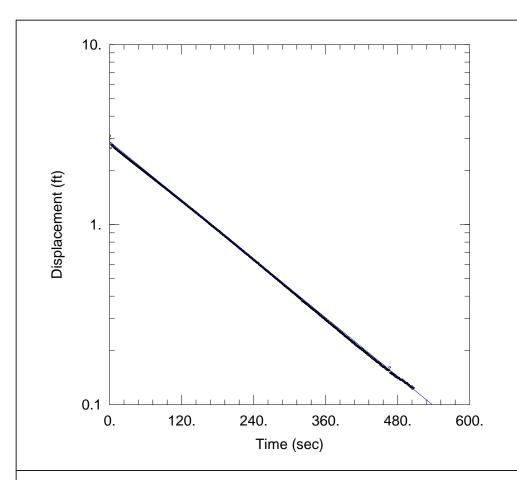
Observation Walls

Aquifer Model: <u>Unconfined</u> Solution Method: <u>Theis</u>

T = $\frac{98.86}{\text{S}}$ ft²/day S = $\frac{0.0002011}{\text{S}}$

 $Kz/Kr = \frac{0.1}{0.61}$ b = 1.61 ft

	Pumping wells		Observation wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTIW-01S	0	0	□ CTIW-01S	0	0	



CTIW-01D SLUG IN 1

Data Set: T:\...\CTIW_01D_slugin_1.aqt

Date: 01/06/17 Time: 14:41:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-01D Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.347 ft/day

y0 = 2.896 ft

AQUIFER DATA

Saturated Thickness: 6. ft

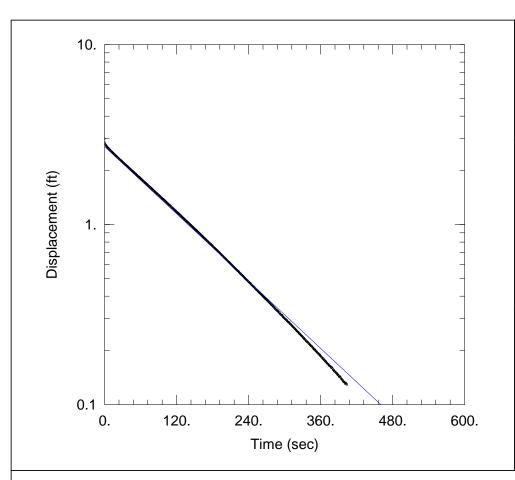
Casing Radius: 0.083 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-01D)

Initial Displacement: 3. ft Static Water Column Height: 15.21 ft Total Well Penetration Depth: 14.5 ft

Screen Length: 5. ft Well Radius: 0.33 ft



CTIW-01D SLUG OUT 1

Data Set: T:\...\CTIW_01D_slugout_1.aqt

Date: 01/06/17

Time: 14:32:29

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-01D Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.543 ft/day

y0 = 2.714 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-01D)

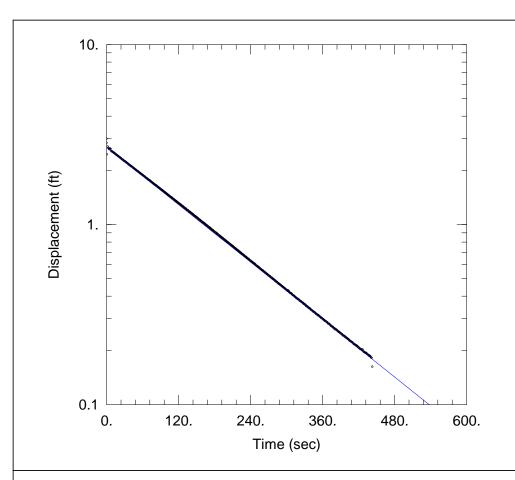
Initial Displacement: 3. ft

Total Well Penetration Depth: 14.5 ft

Casing Radius: 0.083 ft

Static Water Column Height: 15.21 ft

Screen Length: 5. ft Well Radius: 0.33 ft



CTIW-01D SLUG IN 2

Data Set: T:\...\CTIW_01D_slugin_2.aqt

Date: 01/06/17 Time: 14:32:14

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-01D Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.318 ft/day

y0 = 2.689 ft

AQUIFER DATA

Saturated Thickness: 6. ft

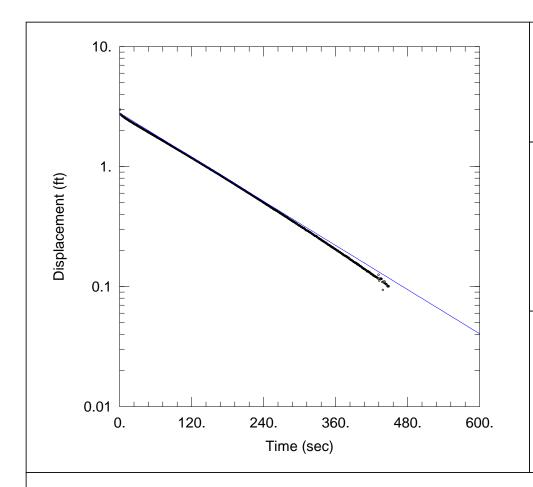
Casing Radius: 0.083 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-01D)

Initial Displacement: 3. ft Static Water Column Height: 15.21 ft Total Well Penetration Depth: 14.5 ft

Screen Length: 5. ft Well Radius: 0.33 ft



CTIW-01D SLUG OUT 2

Data Set: T:\...\CTIW_01D_slugout_2.aqt

Date: 01/06/17

Time: 14:32:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-01D
Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.52 ft/dayy0 = 2.803 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

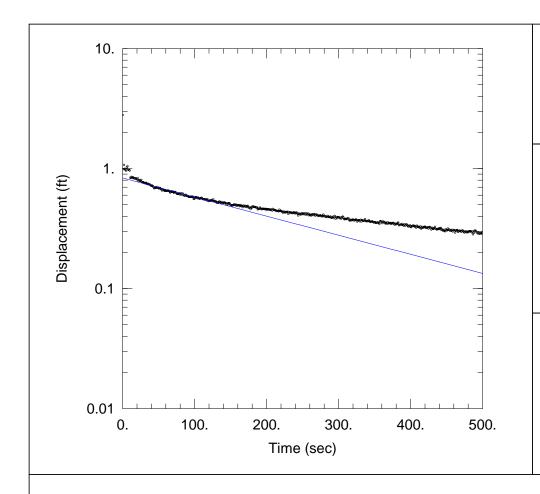
WELL DATA (CTIW-01D)

Initial Displacement: 3. ft
Total Well Penetration Depth: 14.5 ft

Casing Radius: 0.083 ft

Static Water Column Height: 15.21 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



CTIW-01D SLUG IN 1

Data Set: \...\CTIW_01D_slugin_1.aqt

Date: 11/01/17

Time: 14:17:32

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-01D
Test Date: 10/31/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.7944 ft/day

y0 = 0.8348 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-01D)

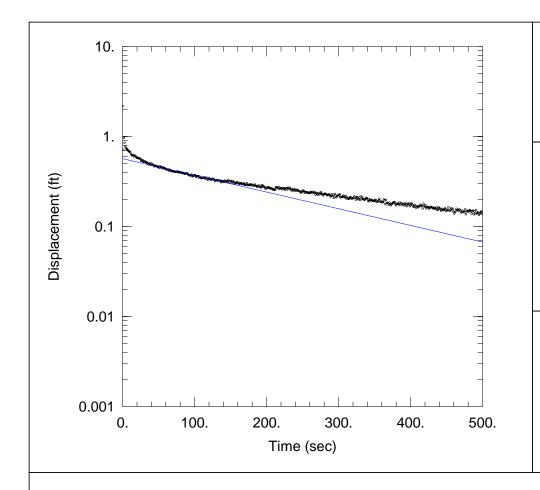
Initial Displacement: 2.795 ft

Total Well Penetration Depth: 15.23 ft

Casing Radius: 0.083 ft

Static Water Column Height: 15.23 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



CTIW-01D SLUG OUT 1

Data Set: \...\CTIW_01D_slugout_1.aqt

Date: <u>11/01/17</u> Time: <u>14:37:09</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-01D
Test Date: 10/31/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.9262 ft/dayy0 = 0.5679 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Initial Displacement: 2.175 ft

Casing Radius: 0.083 ft

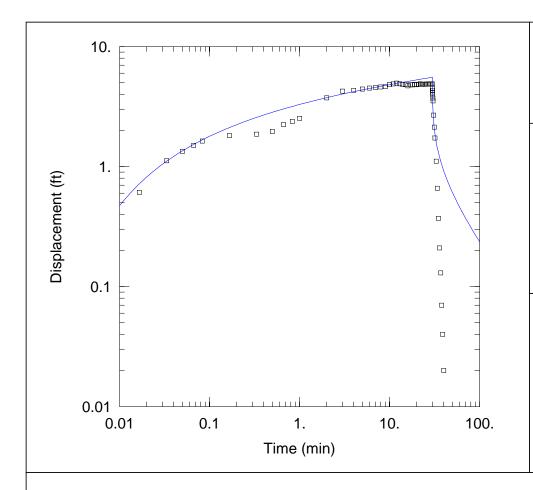
Total Well Penetration Depth: 15.23 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-01D)

Static Water Column Height: 15.23 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



PUMPING TEST FOR CTIW-01D (1.5 L/MIN)

Data Set: \...\CTIW-01D 1.5.aqt

Date: 05/02/17 Time: 09:20:29

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTIW-01D
Test Date: 2-28-2017

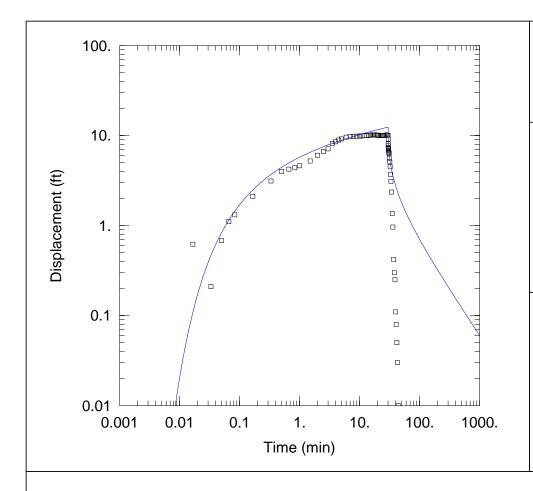
SOLUTION

Aquifer Model: Confined Solution Method: Theis

T = $\frac{9.232}{0.0009148}$ ft²/day

 $Kz/Kr = \overline{0.1}$ b = 6. ft

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTIW-01D	0	0	□ CTIW-01D	0	0	



Dumping Walls

PUMPING TEST FOR CTIW-01D (3.0 L/MIN)

Data Set: \...\CTIW-01D 3.0.aqt

Date: 05/02/17 Time: 09:14:00

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTIW-01D
Test Date: 4-7-2017

SOLUTION

Observation Walls

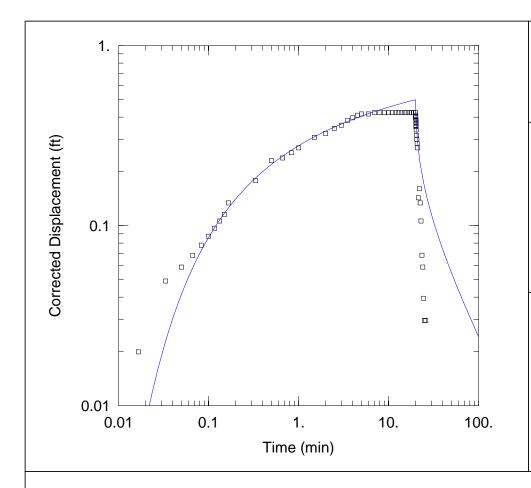
Aquifer Model: Confined Solution Method: Theis

 $T = 6.11 \text{ ft}^2/\text{day}$

S = 0.004891

 $Kz/Kr = \overline{0.1}$ b = 6. ft

	Pumping wells			Observation wells				
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)			
CTIW-01D	0	0	□ CTIW-01D	0	0			



PUMPING TEST FOR CTIW-02S (1.2 L/MIN)

Data Set: T:\...\CTIW-02S 1.2.aqt

Date: 05/02/17 Time: 10:19:39

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTIW-02S
Test Date: 4-6-2017

SOLUTION

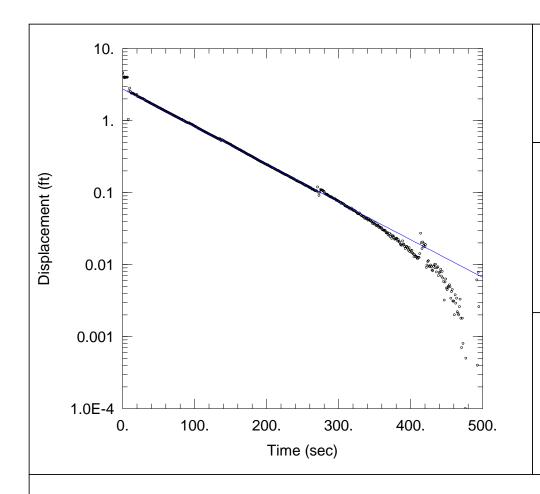
Aquifer Model: <u>Unconfined</u> Solution Method: <u>Theis</u>

 $T = 44.85 \text{ ft}^2/\text{day}$

 $S = \overline{0.03848}$

Kz/Kr = 0.1b = 1.51 ft

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTIW-02S	0	0	□ CTIW-02S	0	0	



CTIW-02D_1 SLUG IN 1

Data Set: T:\...\CTIW_02D_1_slugin_1.aqt

Date: 04/26/17

Time: 09:07:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-02D_1
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9975 ft/day

y0 = 2.749 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

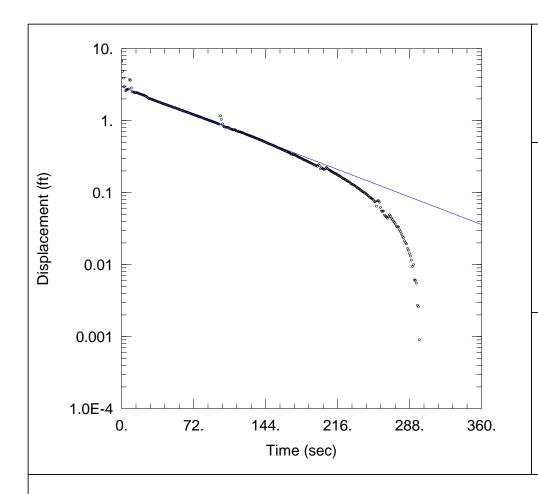
WELL DATA (CTIW-02D)

Static Water Column Height: 25.88 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Initial Displacement: 4.605 ft
Total Well Penetration Depth: 25. ft

Casing Radius: 0.083 ft



CTIW-02D 1 SLUG OUT 1

Data Set: T:\...\CTIW_02D_1_slugout_1.aqt

Date: 04/26/17 Time: 09:08:33

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-02D_1 Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.014}{2.957}$ ft/day

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

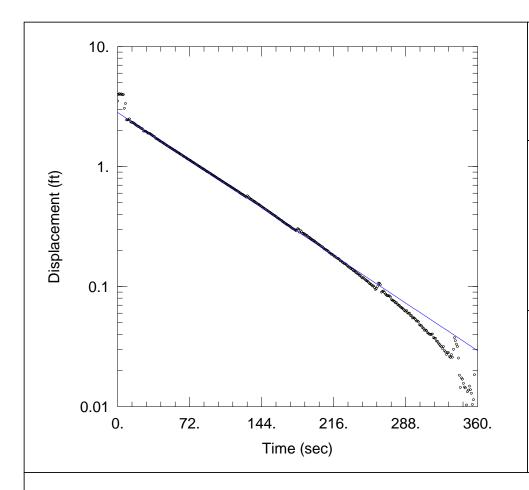
WELL DATA (CTIW-02D)

Static Water Column Height: 25.88 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Initial Displacement: <u>6.654</u> ft Total Well Penetration Depth: 25. ft

Casing Radius: 0.083 ft



CTIW-02D_2 SLUG IN 1

Data Set: T:\...\CTIW_02D_2_slugin_1.aqt

Date: 04/26/17

Time: 09:11:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-02D_2
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.051}{2.828}$ ft/day y0 = $\frac{1.051}{2.828}$ ft

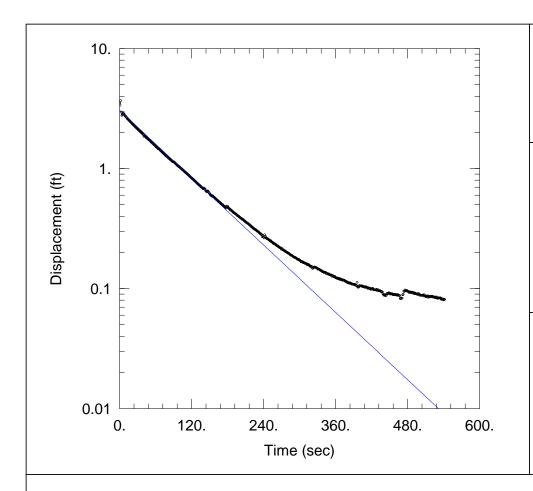
AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-02D)

Initial Displacement: 4. ft Static Water Column Height: 25.88 ft

Total Well Penetration Depth: 25. ft Screen Length: 15. ft Casing Radius: 0.083 ft Well Radius: 0.33 ft



CTIW-02D_2 SLUG OUT 1

Data Set: T:\...\CTIW_02D_2_slugout_1.aqt

Date: <u>04/26/17</u> Time: <u>09:11:33</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-02D_2
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.8915 ft/day

y0 = 3.061 ft

AQUIFER DATA

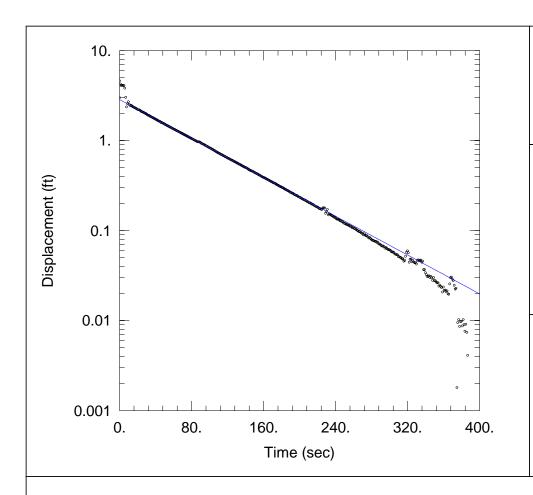
Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-02D)

Initial Displacement: 3.5 ft Static Water Column Height: 25.88 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>25.</u> ft Casing Radius: 0.083 ft



CTIW-02D_3 SLUG IN 1

Data Set: T:\...\CTIW_02D_3_slugin_1.aqt

Date: 04/26/17 Time: 09:12:39

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-02D_3
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.028}{2.849}$ ft/day y0 = $\frac{1.028}{2.849}$ ft

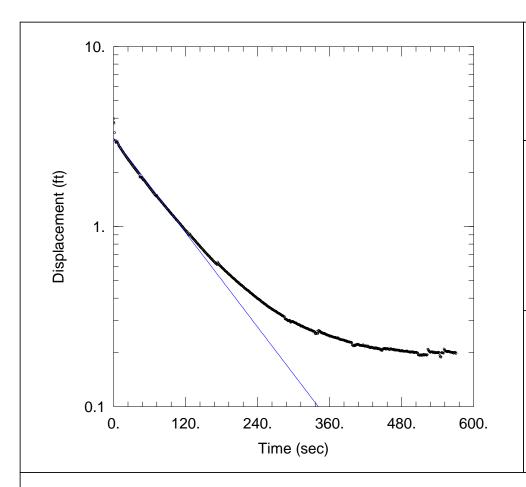
AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-02D)

Initial Displacement: 3. ft Static Water Column Height: 25.88 ft

Total Well Penetration Depth: 25. ft Screen Length: 15. ft Casing Radius: 0.083 ft Well Radius: 0.33 ft



Casing Radius: 0.083 ft

CTIW-02D_3 SLUG OUT 1

Data Set: T:\...\CTIW_02D_3_slugout_1.aqt

Date: 04/26/17 Time: 09:13:05

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-02D_3 Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.8333 ft/day

y0 = 3.1 ft

AQUIFER DATA

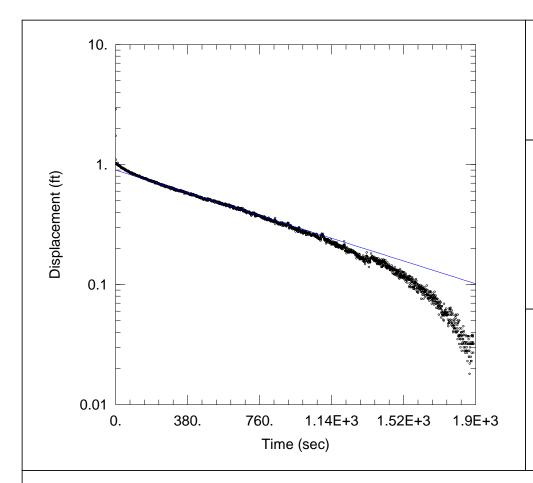
Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-02D)

Initial Displacement: 3.8 ft
Total Well Penetration Depth: 25. ft

Static Water Column Height: 25.88 ft
Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



CTIW-02D SLUG IN 1

Data Set: \...\CTIW_02D_slugin_1.aqt

Date: 11/01/17 Time: 14:03:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-02D
Test Date: 11/1/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.09523 ft/day

y0 = 0.8993 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-02D)

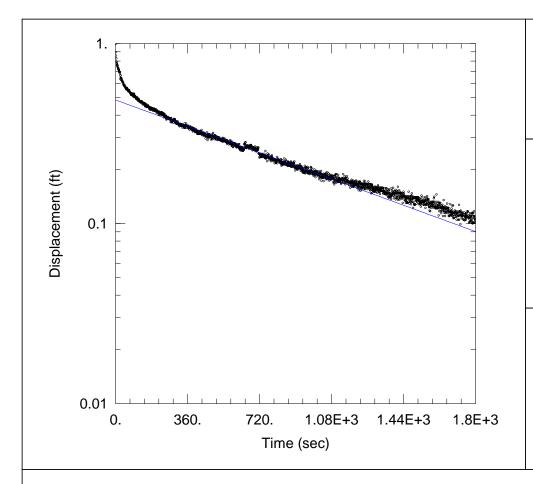
Initial Displacement: 2.89 ft

Total Well Penetration Depth: 25.48 ft

Casing Radius: 0.083 ft

Static Water Column Height: 25.48 ft

Screen Length: 15. ft Well Radius: 0.33 ft



CTIW-02D SLUG OUT 1

Data Set: \...\CTIW_02D_slugout_1.aqt

Date: 11/01/17 Time: 14:05:48

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-02D Test Date: 11/1/2017

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.07765 ft/dayy0 = 0.4861 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

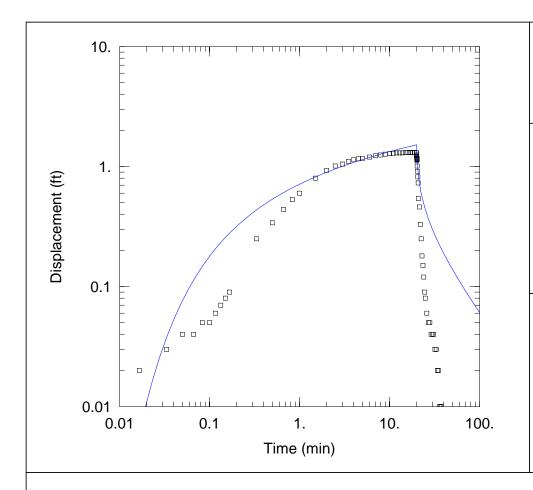
WELL DATA (CTIW-02D)

Initial Displacement: 0.994 ft Static Water Column Height: 25.48 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25.48 ft

Casing Radius: 0.083 ft



PUMPING TEST FOR CTIW-02D (0.7 L/MIN)

Data Set: \...\CTIW-02D 0.7.aqt

Date: 05/02/17 Time: 09:10:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTIW-02D
Test Date: 4-7-2017

SOLUTION

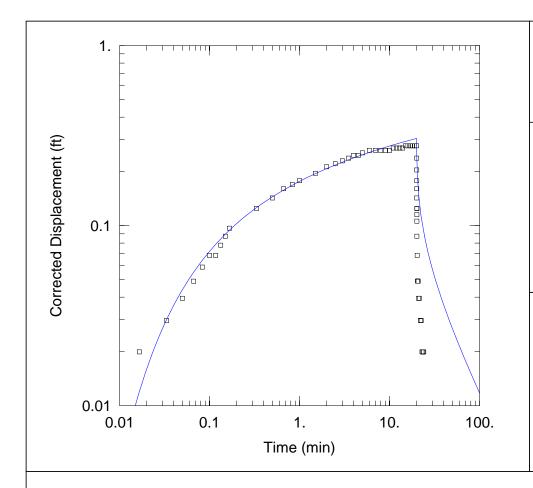
Aquifer Model: <u>Confined</u> Solution Method: <u>Theis</u>

T = $\frac{10.1}{0.01089}$ ft²/day S = $\frac{10.1}{0.01089}$

 $Kz/Kr = \frac{0.1}{1.2}$

b = $\overline{16}$. ft

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTIW-02D	0	0	□ CTIW-02D	0	0	



Dumping Walls

PUMPING TEST FOR CTIW-03S (1.0 L/MIN)

Data Set: T:\...\CTIW-03S 1.0.aqt

Date: 05/02/17 Time: 10:17:47

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV Test Well: CTIW-03S Test Date: 4-6-2017

SOLUTION

Y (ft)

Aquifer Model: Unconfined Solution Method: Theis

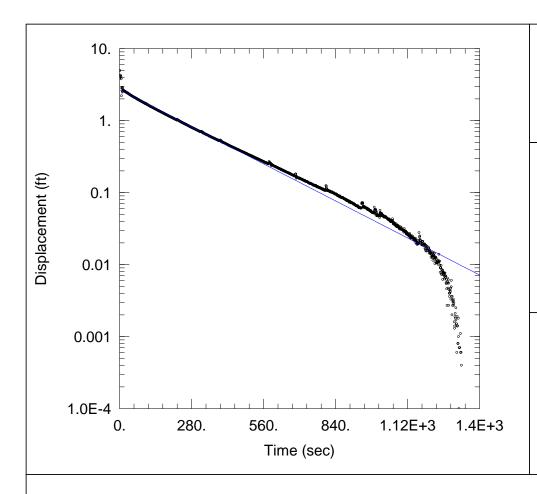
 $= 563.2 \text{ ft}^2/\text{day}$

 $= \overline{0.229}9$

 $Kz/Kr = \overline{0.1}$

= 1.47 ft

	Pumping Wells			Observation Wells
Well Name	X (ft)	Y (ft)	Well Name	X (ft)
CTIW-03S	0	0	□ CTIW-03S	0



Casing Radius: 0.083 ft

CTIW-03D SLUG IN 1

Data Set: T:\...\CTIW_03D_slugin_1.aqt

Date: 05/02/17 Time: 10:55:17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-03D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{0.35}{2.67}$ ft/day y0 = 2.67 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-03D)

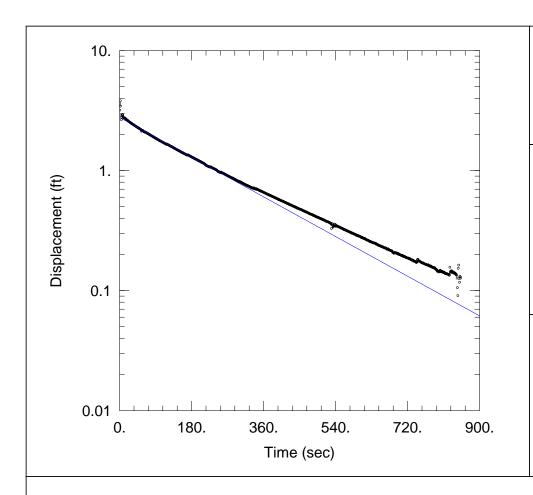
Initial Displacement: <u>5.</u> ft

Total Well Penetration Depth: 25. ft

Static Water Column Height: <u>25.8</u> ft

Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



Casing Radius: 0.083 ft

CTIW-03D SLUG OUT 1

Data Set: T:\...\CTIW_03D_slugout_1.aqt

Date: <u>05/02/17</u> Time: <u>10:58:29</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-03D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.3502 ft/day

y0 = 2.77 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-03D)

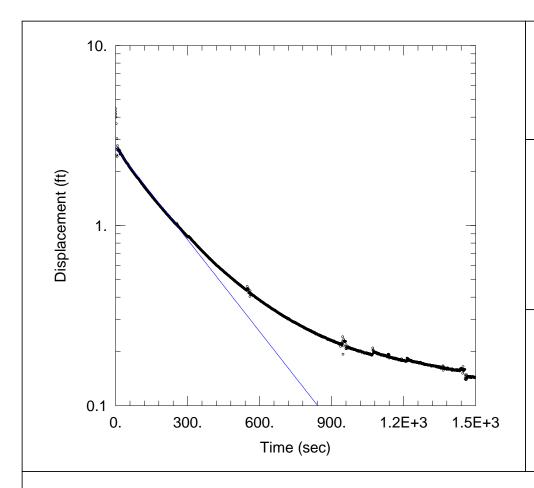
Initial Displacement: 3.5 ft

Total Well Penetration Depth: 25. ft

Static Water Column Height: 25.8 ft

Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



CTIW-03D SLUG IN 2

Data Set: T:\...\CTIW_03D_slugin_2.aqt

Date: 05/02/17 Time: 10:56:49

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-03D Test Date: 4/10/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.3242 ft/day

y0 = 2.704 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

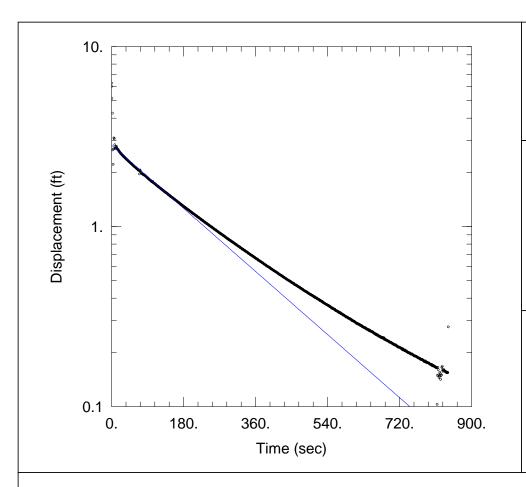
WELL DATA (CTIW-03D)

Initial Displacement: 4.3 ft Static Water Column Height: 25.8 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25. ft

Casing Radius: 0.083 ft



CTIW-03D SLUG OUT 2

Data Set: T:\...\CTIW_03D_slugout_2.aqt

Date: 05/02/17 Time: 11:01:01

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTIW-03D Test Date: 4/10/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.3713 ft/day

y0 = 2.832 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

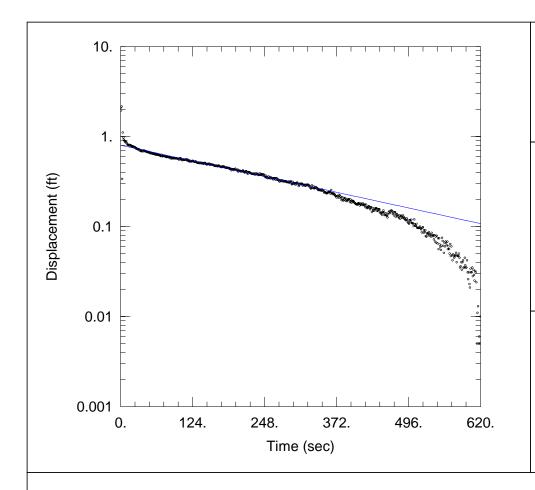
WELL DATA (CTIW-03D)

Initial Displacement: 6. ft Static Water Column Height: 25.8 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25. ft

Casing Radius: 0.083 ft



CTIW-03D SLUG IN 1

Data Set: \...\CTIW_03D_slugin_1.aqt

Date: 11/01/17

Time: 14:32:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-03D
Test Date: 11/1/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

Solution Method. Bodw

K = 0.2681 ft/dayy0 = 0.8016 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

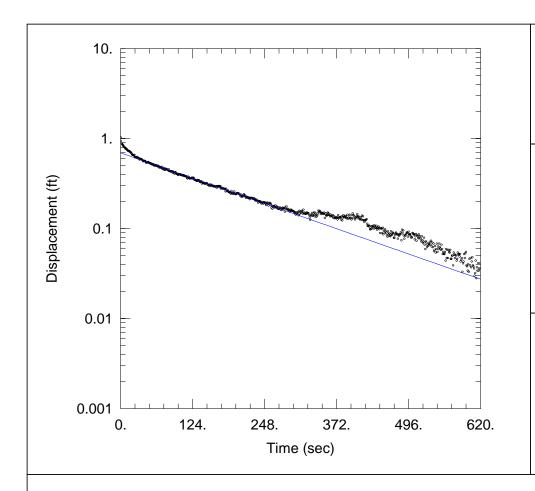
WELL DATA (CTIW-03D)

Static Water Column Height: 25.16 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>25.16</u> ft Casing Radius: 0.083 ft

Initial Displacement: 2.089 ft



CTIW-03D SLUG OUT 1

Data Set: \...\CTIW_03D_slugout_1.aqt

Date: <u>11/01/17</u> Time: <u>14:30:11</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTIW-03D
Test Date: 11/1/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.4321 ft/dayy0 = 0.6938 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTIW-03D)

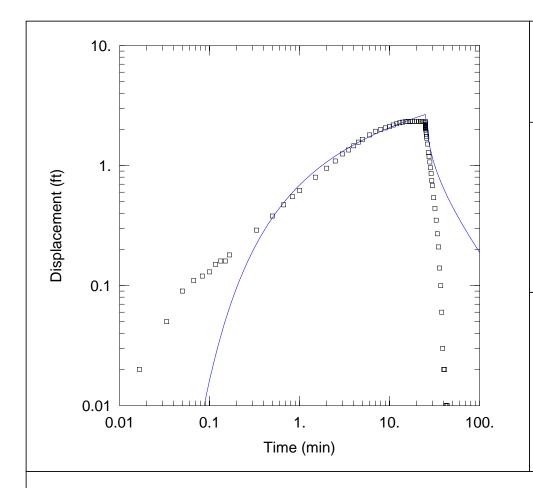
Initial Displacement: 1.03 ft

Total Well Penetration Depth: 25.16 ft

Static Water Column Height: 25.16 ft

Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



PUMPING TEST FOR CTIW-03D (0.5 L/MIN)

Data Set: T:\...\CTIW-03D 0.5.aqt

Date: 05/02/17 Time: 09:23:53

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTIW-03D
Test Date: 4-7-2017

SOLUTION

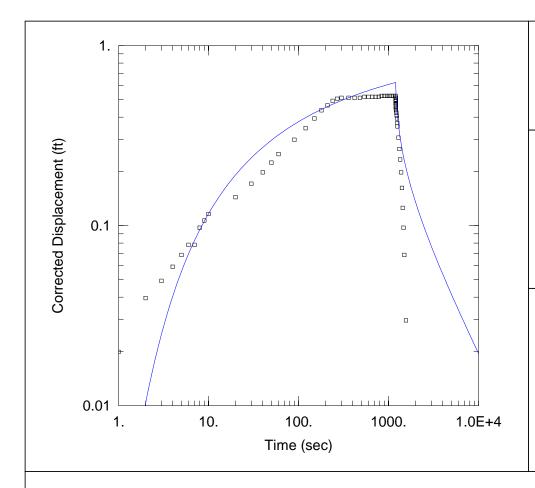
Aquifer Model: Confined Solution Method: Theis

 $T = 3.014 \text{ ft}^2/\text{day}$

S = 0.01897

 $Kz/Kr = \frac{0.1}{16.}$ ft

	Pumping Wells			Observation Wells	
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTIW-03D	0	0	□ CTIW-03D	0	0



PUMPING TEST FOR CTMW-01S, 1.0 L/MIN

Data Set: \...\CTMW-01S 1.0.aqt

Date: 10/25/17 Time: 13:04:28

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-01S Test Date: 2/28/2017

SOLUTION

Y (ft)

Aquifer Model: Unconfined Solution Method: Theis

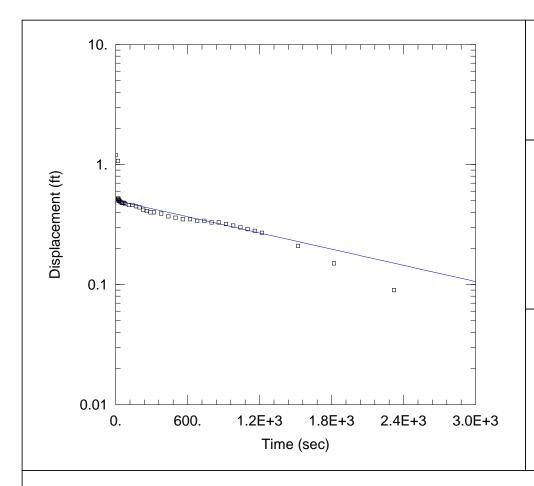
 $= 26. \text{ ft}^2/\text{day}$

 $= \overline{0.0}3831$ S

 $Kz/Kr = \overline{0.1}$

 $= \overline{1.79}$ ft

	Pumping Wells			Observation Wells
Well Name	X (ft)	Y (ft)	Well Name	X (ft)
CTMW-01S	0	0	□ CTMW-01S	0



PUMPING TEST FOR CTMW-01S 0.2 (L/MIN)

Data Set: \...\CTMW-01S 0.2_Bouwer-Rice_slugtest.aqt

Date: 10/25/17

Time: 14:17:26

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-01S Test Date: 10/10/2017

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.4133 ft/dayy0 = 0.5016 ft

AQUIFER DATA

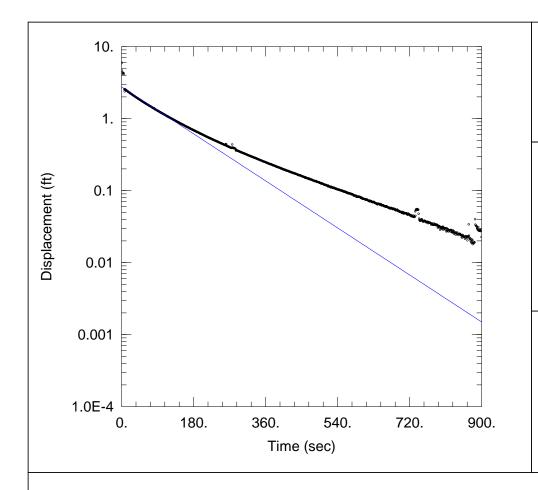
Saturated Thickness: 1.32 ft Anisotropy Ratio (Kz/Kr): 0.004

WELL DATA (CTMW-01S)

Static Water Column Height: 1. ft Initial Displacement: 1.2 ft

Screen Length: 1. ft Well Radius: 0.3333 ft

Total Well Penetration Depth: 1. ft



CTMW-01D SLUG IN 1

Data Set: T:\...\CTMW_01D_slugin_1.aqt

Date: 04/27/17 Time: 08:26:55

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-01D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.5072 ft/dayy0 = 2.763 ft

AQUIFER DATA

Saturated Thickness: 5. ft

Anisotropy Ratio (Kz/Kr): 0.1

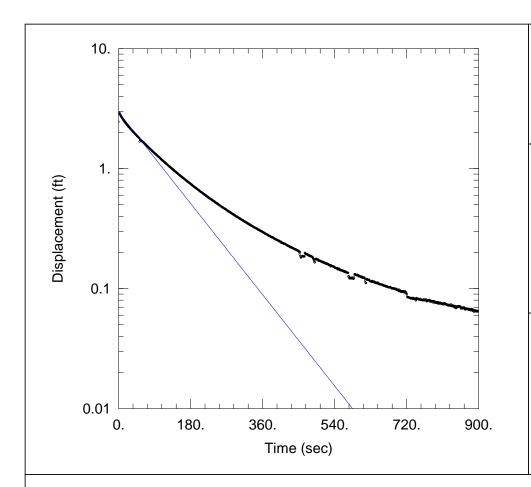
WELL DATA (CTMW-01D)

Initial Displacement: 6. ft

Total Well Penetration Depth: 25.5 ft Casing Radius: 0.083 ft

Static Water Column Height: 26.13 ft

Screen Length: 16. ft Well Radius: 0.33 ft



CTMW-01D SLUG OUT 1

Data Set: T:\...\CTMW_01D_slugout_1.aqt

Date: 04/27/17 Time: 08:27:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-01D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.5903 ft/day

y0 = 2.952 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

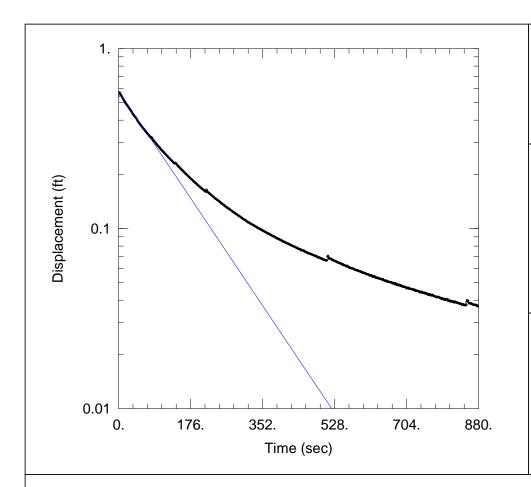
WELL DATA (CTMW-01D)

Static Water Column Height: 26.13 ft

Screen Length: 16. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25.5 ft Casing Radius: 0.083 ft

Initial Displacement: 2.9 ft



CTMW-01D SLUG IN 1

Data Set: \...\CTMW_01D_slugin_1.aqt

Date: <u>10/23/17</u> Time: <u>09:39:29</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-01D
Test Date: 10/04/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.651 ft/dayy0 = 0.5827 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

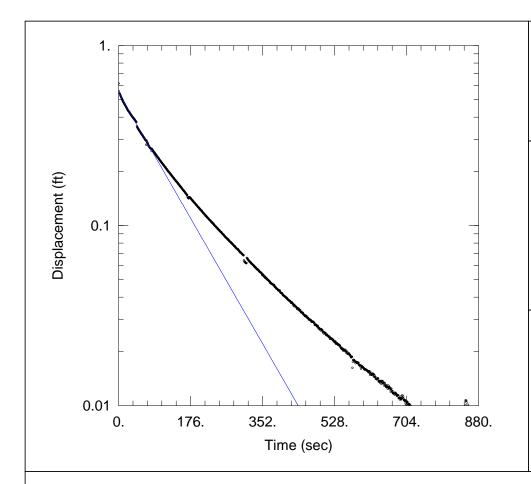
WELL DATA (CTMW-01D)

Static Water Column Height: 26.3 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 26.3 ft Casing Radius: 0.083 ft

Initial Displacement: 0.5431 ft



CTMW-01D SLUG OUT 1

Data Set: \...\CTMW_01D_slugout_1.aqt Time: 09:39:53

Date: 10/23/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-01D Test Date: 10/04/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.7604 ft/day

y0 = 0.5466 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

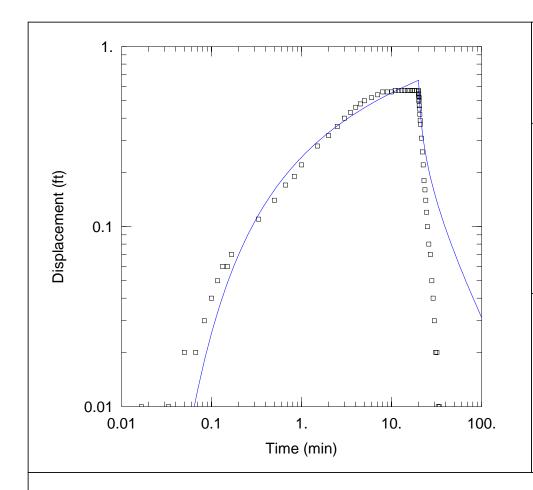
WELL DATA (CTMW-01D)

Static Water Column Height: 26.3 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 26.3 ft Casing Radius: 0.083 ft

Initial Displacement: 0.6148 ft



PUMPING TEST FOR CTMW-01D (0.3 L/MIN)

Data Set: T:\...\CTMW-01D 0.3.aqt

Date: <u>05/02/17</u> Time: <u>09:27:40</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTMW-01D
Test Date: 4-7-2017

SOLUTION

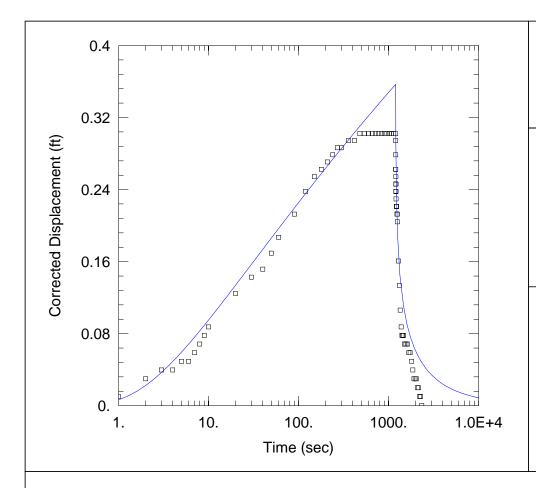
Aquifer Model: Confined Solution Method: Theis

T = $\frac{8.709}{\text{S}}$ ft²/day S = $\frac{0.024}{32}$

Kz/Kr = 0.022

 $b = \frac{31}{16}$. ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-01D	0	0	□ CTMW-01D	0	0



PUMPING TEST FOR CTMW-02S (0.7 L/MIN)

Data Set: T:\...\CTMW-02S 0.7.aqt

Date: 05/02/17 Time: 10:11:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02S
Test Date: 4/6/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: <u>Theis</u>

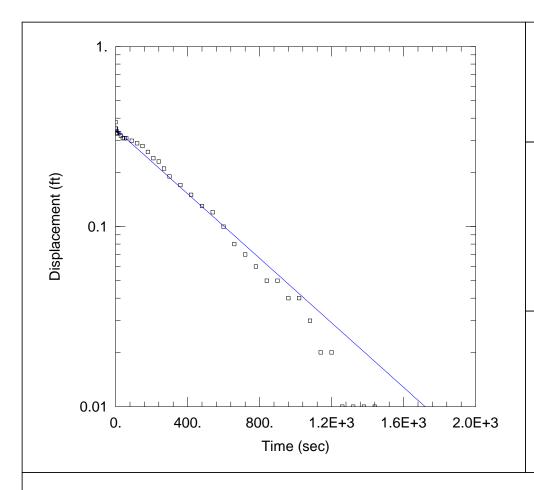
 $T = 40.72 \text{ ft}^2/\text{day}$

S = 0.02596

Kz/Kr = 0.1

 $= \overline{1.5}3 \text{ ft}$

Pumping Wells				Observation Wells	
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-02S	0	0	□ CTMW-02S	0	0



PUMPING TEST FOR CTMW-02S 0.1 (L/MIN)

Data Set: \...\CTMW-02S 0.1_Bouwer-Rice_slugtest.aqt

Date: 10/25/17

Time: 14:17:42

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02S
Test Date: 10/10/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Bouwer-Rice

K = 0.5081 ft/dayy0 = 0.3475 ft

AQUIFER DATA

Saturated Thickness: <u>0.7865</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1023</u>

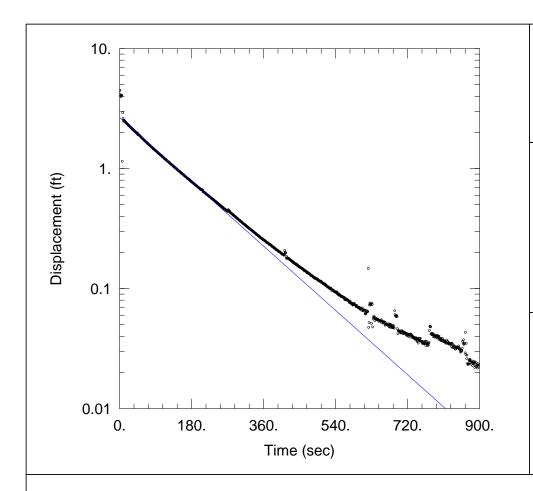
WELL DATA (CTMW-02S)

Static Water Column Height: 1. ft

Screen Length: 1. ft Well Radius: 0.3333 ft

Initial Displacement: 0.38 ft

Total Well Penetration Depth: 1. ft



Casing Radius: 0.083 ft

CTMW-02D SLUG IN 1

Data Set: T:\...\CTMW_02D_slugin_1.aqt

Date: <u>05/02/17</u> Time: <u>10:49:29</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.5674 ft/day

 $y0 = \overline{2.664} \, ft$

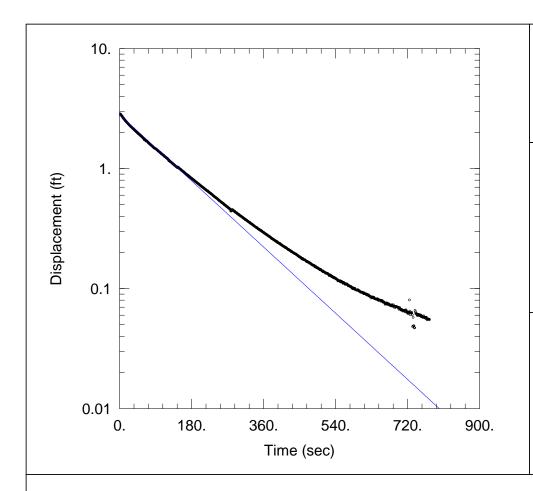
AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-02D)

Initial Displacement: 4.5 ft Static Water Column Height: 25.68 ft Total Well Penetration Depth: 25. ft Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



CTMW-02D SLUG OUT 1

Data Set: T:\...\CTMW_02D_slugout_1.aqt

Date: <u>05/02/17</u> Time: <u>10:51:31</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.5841 ft/day

y0 = 2.816 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

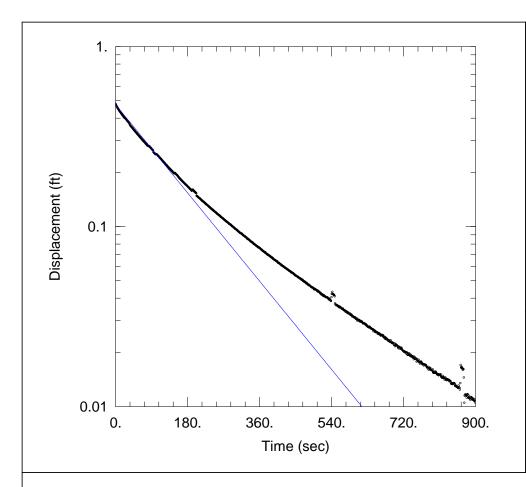
WELL DATA (CTMW-02D)

Static Water Column Height: 25.68 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Initial Displacement: 2.85 ft

Total Well Penetration Depth: 25. ft



CTMW-02D SLUG IN 1

Data Set: \...\CTMW_02D_slugin_1.aqt

Date: <u>10/23/17</u> Time: <u>09:40:08</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02D
Test Date: 10/04/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.522 ft/dayy0 = 0.4765 ft

AQUIFER DATA

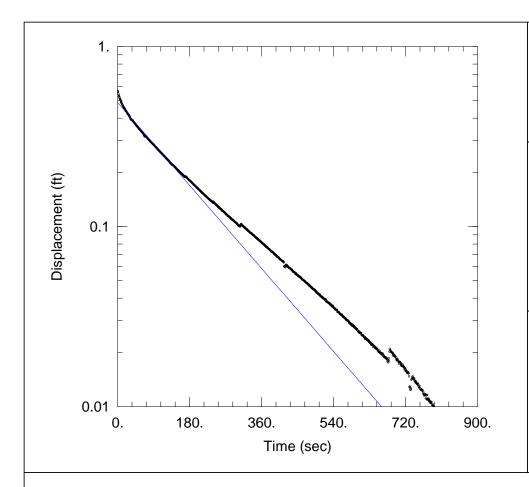
Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-02D)

Static Water Column Height: 25.8 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Initial Displacement: $\underline{0.4798}$ ft Total Well Penetration Depth: $\underline{25.8}$ ft



CTMW-02D SLUG OUT 1

Data Set: \...\CTMW_02D_slugout_1.aqt

Date: 10/23/17

Time: 09:40:19

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-02D
Test Date: 10/04/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4909 ft/day

y0 = 0.4902 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

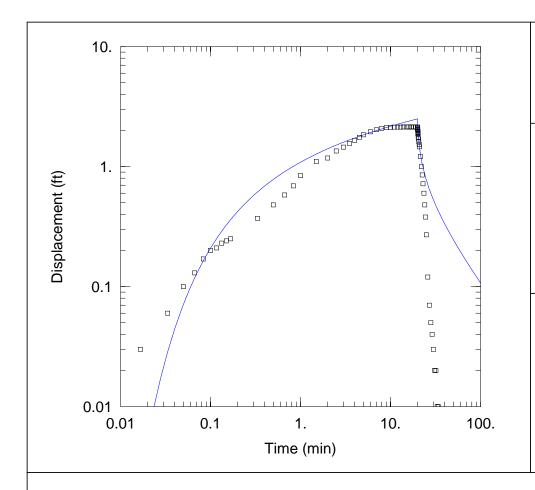
WELL DATA (CTMW-02D)

Static Water Column Height: 25.8 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25.8 ft Casing Radius: 0.083 ft

Initial Displacement: 0.5658 ft



PUMPING TEST FOR CTMW-02D (0.75 L/MIN)

Data Set: T:\...\CTMW-02D 0.75.aqt

Date: 05/02/17 Time: 09:38:58

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTMW-02D
Test Date: 4-7-2017

SOLUTION

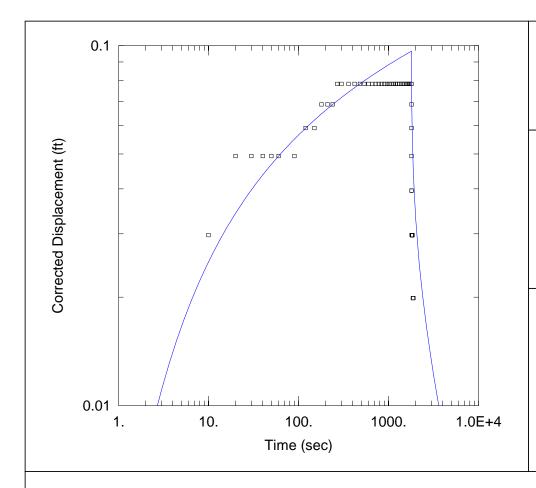
Aquifer Model: Confined Solution Method: Theis

 $T = 6.373 \text{ ft}^2/\text{day}$

 $= \overline{0.009936}$

Kz/Kr = 0.1b = 16. ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-02D	0	0	□ CTMW-02D	0	0



PUMPING TEST FOR CTMW-03S (0.5 L/MIN)

Data Set: T:\...\CTMW-03S 0.5.aqt

Date: 05/01/17 Time: 16:44:41

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-03S
Test Date: 2/28/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Theis

 $T = 136.9 \text{ ft}^2/\text{day}$

S = 0.06285

Kz/Kr = 0.1

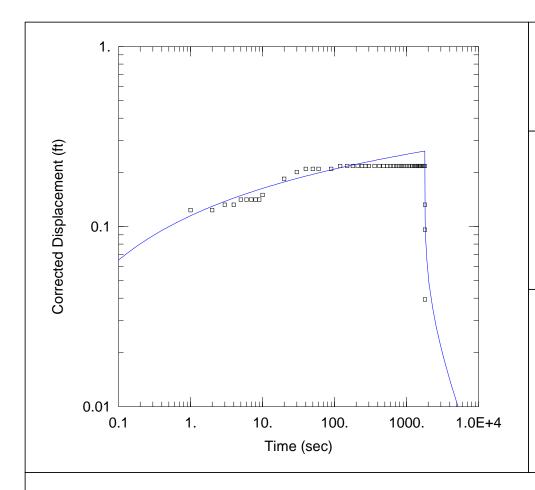
 $b = \overline{1.83} \text{ ft}$

WELL DATA

l		Pumping Wells		
١	Well Name	X (ft)	Y (ft)	Well Name
l	CTMW-03S	0	0	□ CTMW-0

Well Name	X (ft)	Y (ft)
□ CTMW-03S	0	0

Observation Wells



PUMPING TEST FOR CTMW-03S 1 (L/MIN)

Data Set: \...\CTMW-03S 1.aqt

Date: 10/25/17 Time: 14:17:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-03S Test Date: 10/9/2017

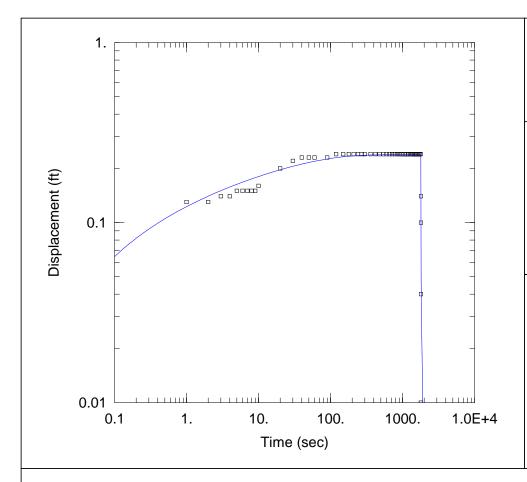
SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Theis

 $= \frac{168.3}{0.000} \text{ ft}^2/\text{day}$ $= \frac{168.3}{0.000} 1075$

 $Kz/Kr = \overline{0.1}$ $= \overline{1.26}$ ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-03S	0	0	□ CTMW-03S	0	0



PUMPING TEST FOR CTMW-03S 1 (L/MIN)

Data Set: \...\CTMW-03S 1_leaky_Hantush-Jacob.aqt Date: 10/25/17 Time: 14:18:21

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-03S Test Date: 10/9/2017

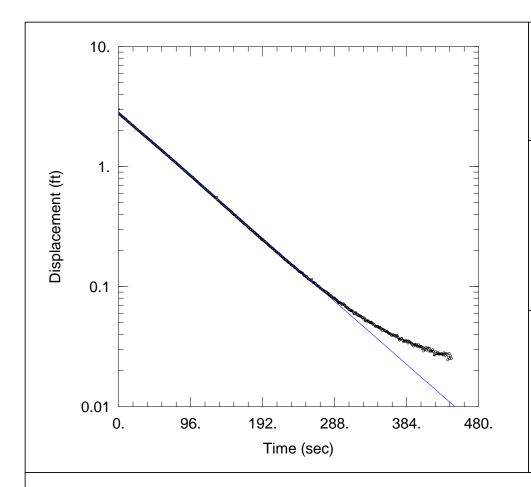
SOLUTION

Aquifer Model: <u>Leaky</u> Solution Method: <u>Hantush-Jacob</u>

 $= 155.1 \text{ ft}^2/\text{day}$ $= \overline{0.000}1362$ r/B = 0.01086 $Kz/Kr = \overline{0.1}$

 $= \overline{1.26}$ ft

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTMW-03S	0	0	□ CTMW-03S	0	0	



CTMW-03D SLUG IN 1

Data Set: T:\...\CTIW_03D_slugin_1.aqt

Date: <u>04/27/17</u> Time: <u>12:13:24</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-03D
Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.457}{2.854}$ ft/day y0 = $\frac{2.854}{2.854}$ ft

AQUIFER DATA

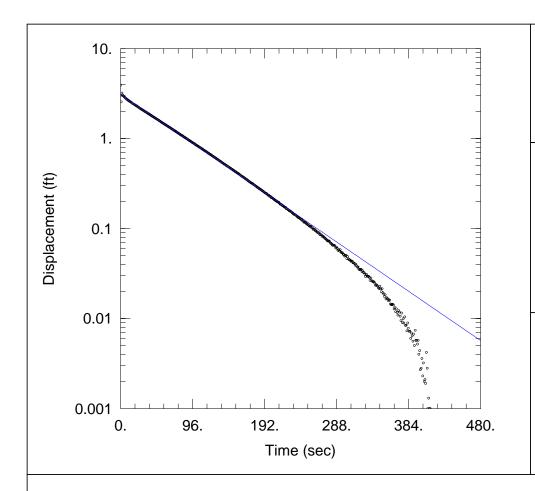
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-03D)

Initial Displacement: 3. ft Static Water Column Height: 16.4 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 15. ft



CTMW-03D SLUG OUT 1

Data Set: T:\...\CTMW_03D_slugout_1.aqt

Date: <u>04/27/17</u> Time: <u>12:09:53</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-03D
Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.559}{2.42}$ ft/day

 $y0 = \overline{3.12} \text{ ft}$

AQUIFER DATA

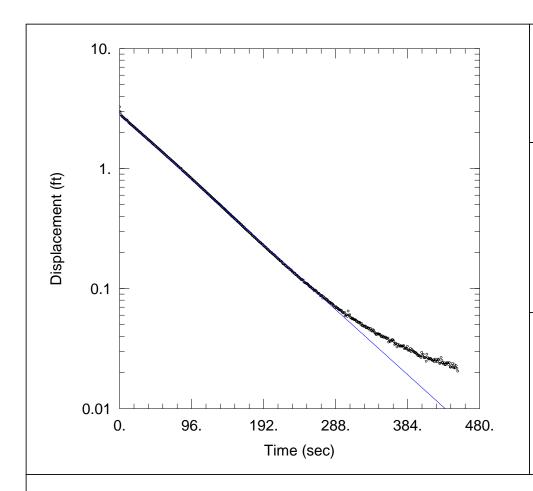
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-03D)

Initial Displacement: 3. ft Static Water Column Height: 16.4 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft

Total Well Penetration Depth: 15. ft



Casing Radius: 0.083 ft

CTMW-03D SLUG IN 2

Data Set: T:\...\CTMW_03D_slugin_2.aqt

Date: <u>04/27/17</u> Time: <u>12:14:21</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-03D
Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.535 ft/dayy0 = 2.834 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-03D)

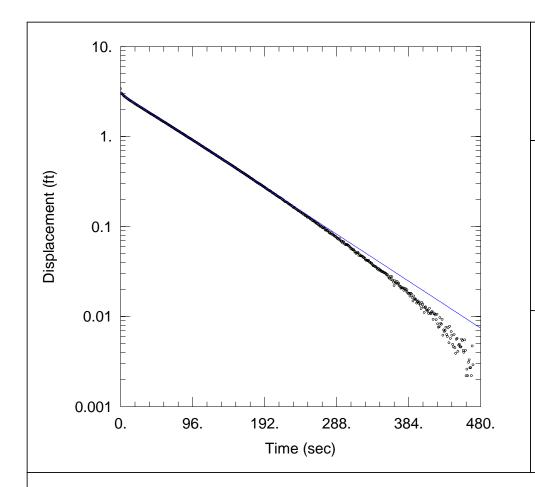
Initial Displacement: 3. ft

Total Well Penetration Depth: 15. ft

Static Water Column Height: 16.4 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



CTMW-03D SLUG OUT 2

Data Set: T:\...\CTMW_03D_slugout_2.aqt

Date: 04/27/17 Time: 12:09:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-03D Test Date: 12/09/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.44 ft/day $y0 = \overline{3.04}$ ft

AQUIFER DATA

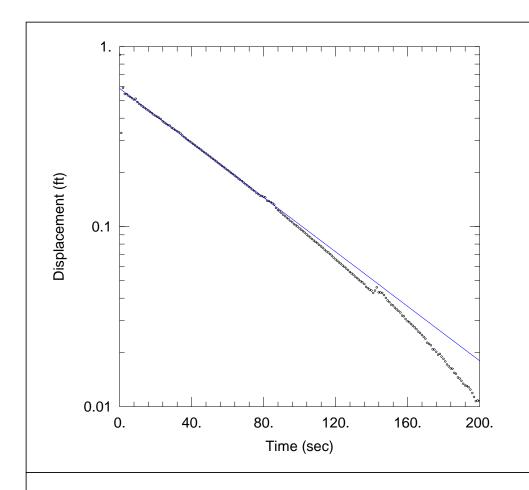
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-03D)

Initial Displacement: 3. ft Static Water Column Height: 16.4 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 15. ft



CTMW-03D SLUG IN 1

Data Set: \...\CTMW_03D_slugin_1.aqt

Time: 09:40:34 Date: 10/23/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-03D Test Date: 10/05/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.455 ft/day

y0 = 0.586 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

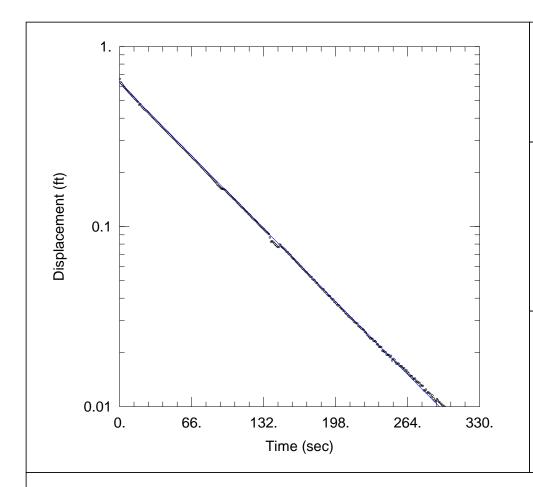
WELL DATA (CTMW-03D)

Static Water Column Height: 16.62 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 16.62 ft Casing Radius: 0.083 ft

Initial Displacement: 0.8979 ft



CTMW-03D SLUG OUT 1

Data Set: \...\CTMW_03D_slugout_1.aqt

Time: 09:40:46 Date: 10/23/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-03D Test Date: 10/05/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.803 ft/dayy0 = 0.6301 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

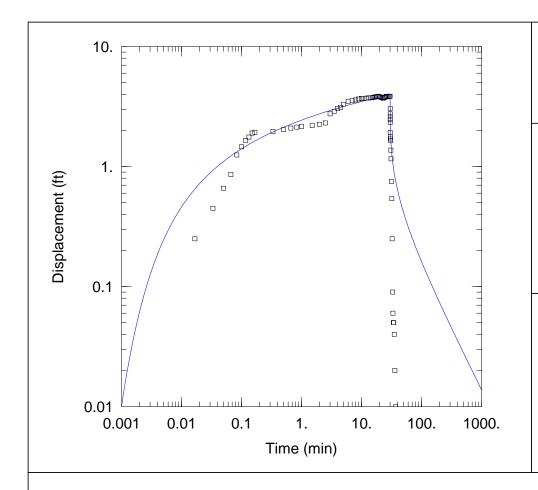
WELL DATA (CTMW-03D)

Static Water Column Height: 16.62 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Initial Displacement: 0.6609 ft

Total Well Penetration Depth: 16.62 ft



PUMPING TEST FOR CTMW-03D (2.0 L/MIN)

Data Set: T:\...\CTMW-03D 2.0.aqt

Date: 05/02/17 Time: 09:46:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTMW-03D
Test Date: 2-28-2017

SOLUTION

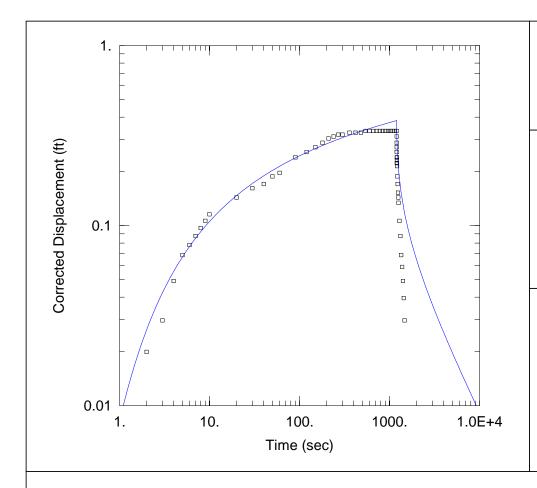
Aquifer Model: Confined Solution Method: Theis

 $T = 17.92 \text{ ft}^2/\text{day}$

= 0.001163

 $Kz/Kr = \overline{0.1}$ b = 6. ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-03D	0	0	□ CTMW-03D	0	0



PUMPING TEST FOR CTMW-04S (1.0 L/MIN)

Data Set: T:\...\CTMW-04S 1.0.aqt

Date: 05/01/17 Time: 16:50:04

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-04S
Test Date: 4/7/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Theis

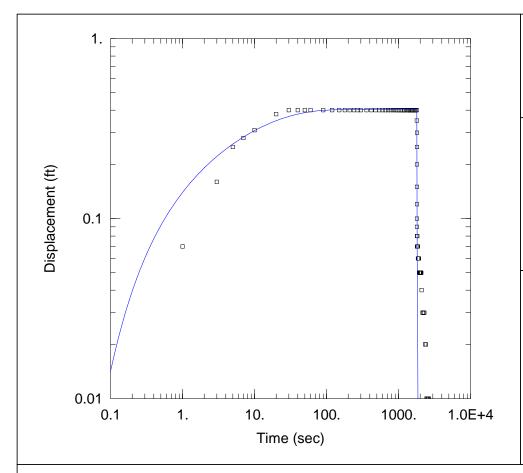
 $T = 55.43 \text{ ft}^2/\text{day}$

S = 0.03257

Kz/Kr = 0.1

 $b = \overline{1.63} \text{ ft}$

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-04S	0	0	□ CTMW-04S	0	0
				'	



PUMPING TEST FOR CTMW-04S 0.5 (L/MIN)

Data Set: \...\CTMW-04S 0.5_Hantush-Jacob.aqt Date: 10/25/17 Time: 14:18:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-04S Test Date: 10/9/2017

SOLUTION

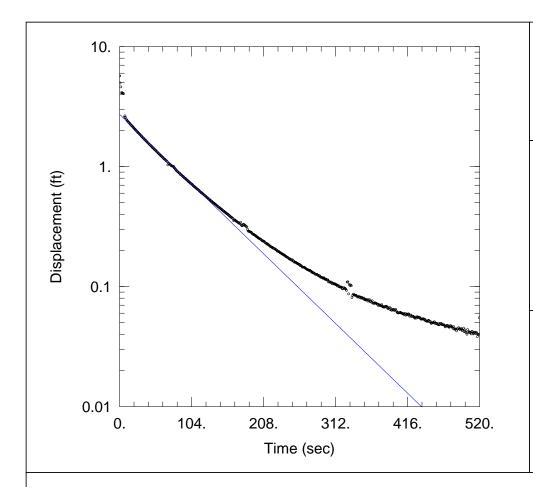
Aquifer Model: <u>Leaky</u> Solution Method: <u>Hantush-Jacob</u>

 $= 23.95 \text{ ft}^2/\text{day}$ $= \overline{0.001}151$

 $r/B = \overline{0.1}$ $Kz/Kr = \overline{0.1}$

= 1.05 ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-04S	0	0	□ CTMW-04S	0	0



CTMW-04D SLUG IN 1

Data Set: T:\...\CTMW_04D_slugin_1.aqt

Date: 05/02/17 Time: 10:24:06

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-04D Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.065 ft/dayy0 = 2.729 ft

AQUIFER DATA

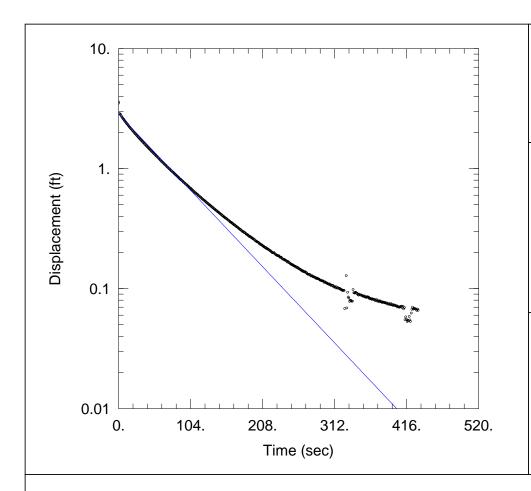
Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-04D)

Initial Displacement: 5.7 ft Static Water Column Height: 25.68 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25. ft



Casing Radius: 0.083 ft

CTMW-04D SLUG OUT 1

Data Set: T:\...\CTMW_04D_slugout_1.aqt

Date: <u>05/02/17</u> Time: <u>10:25:08</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-04D
Test Date: 4/10/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.164}{2.841}$ ft/day y0 = 2.841 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-04D)

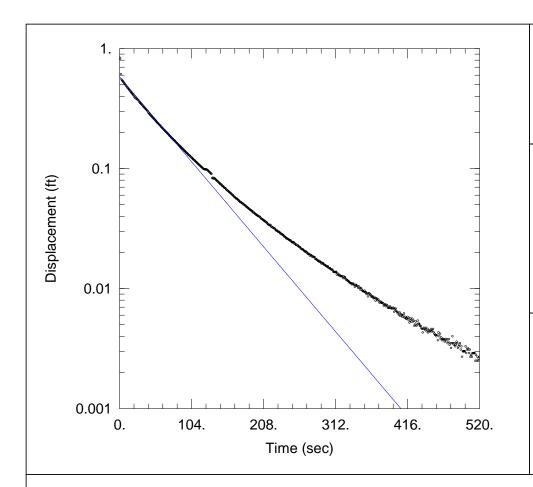
Initial Displacement: 3.5 ft

Total Well Penetration Depth: 25. ft

Static Water Column Height: 25.68 ft

Screen Length: 15. ft

Screen Length: 15. ft Well Radius: 0.33 ft



CTMW-04D SLUG IN 1

Data Set: \...\CTMW_04D_slugin_1.aqt

Date: <u>10/23/17</u> Time: <u>09:40:59</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-04D
Test Date: 10/05/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.303}{0.5817}$ ft/day y0 = 0.5817 ft

AQUIFER DATA

Saturated Thickness: 16. ft Anisotropy Ratio (Kz/Kr): 0.1

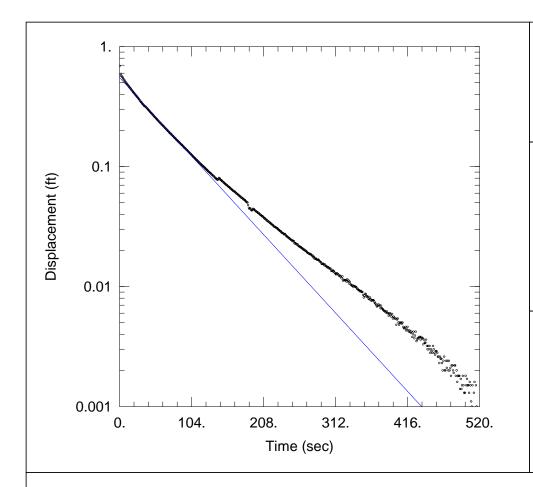
WELL DATA (CTMW-04D)

Static Water Column Height: 25.85 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Initial Displacement: <u>0.8383</u> ft

Total Well Penetration Depth: 25.85 ft



CTMW-04D SLUG OUT 1

Data Set: \...\CTMW_04D_slugout_1.aqt

Date: 10/23/17

Time: 09:41:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-04D Test Date: 10/05/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.204 ft/day

y0 = 0.5512 ft

AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio (Kz/Kr): 0.1

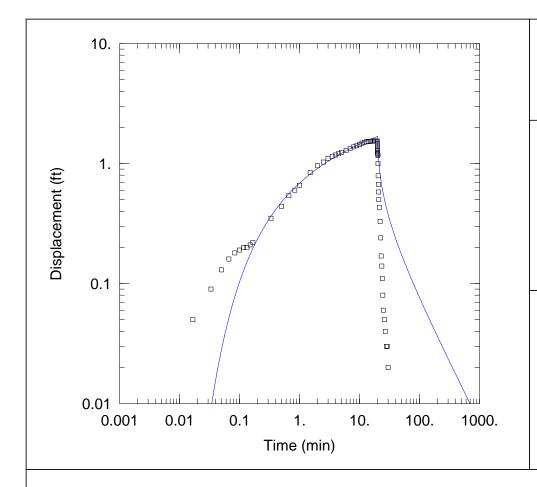
WELL DATA (CTMW-04D)

Static Water Column Height: 25.85 ft

Screen Length: 15. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 25.85 ft Casing Radius: 0.083 ft

Initial Displacement: 0.6876 ft



PUMPING TEST FOR CTMW-04D (0.5 L/MIN)

Data Set: T:\...\CTMW-04D 0.5.aqt

Date: 05/02/17 Time: 10:03:51

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Project: In-Situ Chromium Treatment

Location: Henderson NV
Test Well: CTMW-04D
Test Date: 4-7-2017

SOLUTION

Aquifer Model: Confined Solution Method: Theis

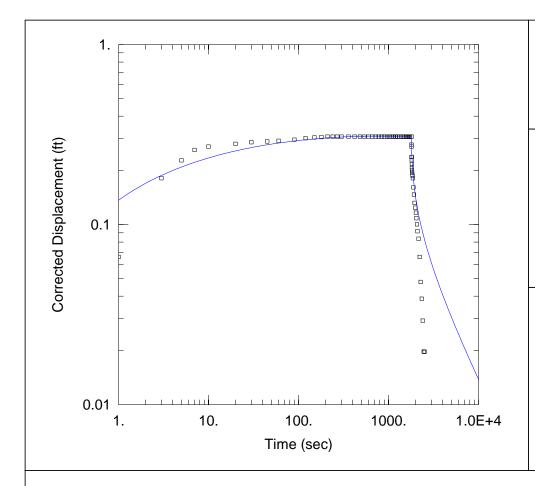
 $T = 5.813 \text{ ft}^2/\text{day}$

 $S = \overline{0.01191}$

 $Kz/Kr = \overline{0.1}$

b = 16. ft

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-04D	0	0	□ CTMW-04D	0	0



PUMPING TEST FOR CTMW-05S (0.5 L/MIN)

Data Set: \...\CTMW-05S 0.5.aqt

Date: 10/25/17 Time: 14:18:48

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-05S
Test Date: 10/9/2017

SOLUTION

Y (ft)

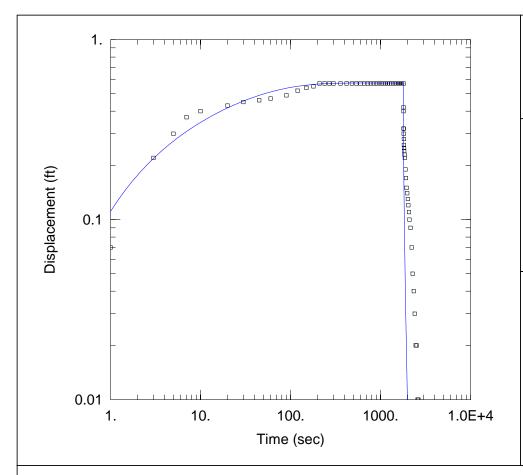
Aquifer Model: <u>Unconfined</u> Solution Method: Theis

 $T = 28.3 \text{ ft}^2/\text{day}$ S = 0.000768

Kz/Kr = 0.1

 $b = \overline{0.62} \text{ ft}$

	Pumping Wells	Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)
CTMW-05S	0	0	□ CTMW-05S	0



PUMPING TEST FOR CTMW-05S (0.5 L/MIN)

Data Set: \...\CTMW-05S 0.5_Hantush-Jacob.aqt Date: 10/25/17 Time: 14:19:01

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-05S Test Date: 10/9/2017

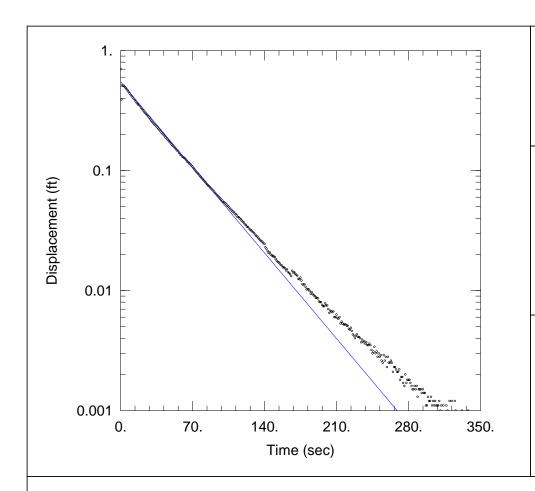
SOLUTION

Aquifer Model: <u>Leaky</u> Solution Method: <u>Hantush-Jacob</u>

 $= 16.84 \text{ ft}^2/\text{day}$ $=\overline{0.002}005$

 $r/B = \overline{0.1}$ $Kz/Kr = \overline{0.1}$ $= \overline{0.62}$ ft

	Pumping Wells			Observation Wells	
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
CTMW-05S	0	0	□ CTMW-05S	0	0



CTMW-05D SLUG IN 1

Data Set: \...\CTMW_05D_slugin_1.aqt

Date: 10/23/17 Time: 09:41:28

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-05D
Test Date: 10/05/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.453 ft/dayy0 = 0.5498 ft

AQUIFER DATA

Saturated Thickness: 21. ft Anisotropy Ratio (Kz/Kr): 0.1

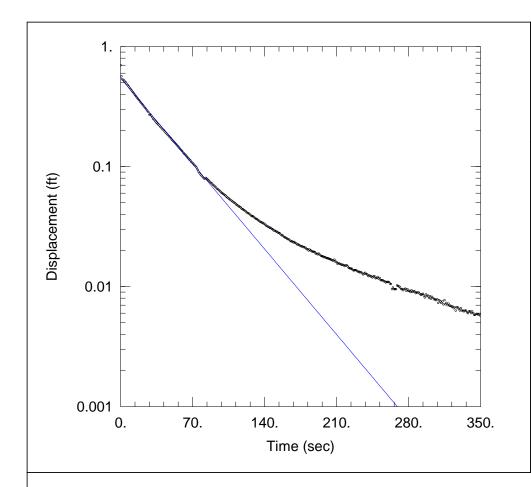
WELL DATA (CTMW-05D)

Static Water Column Height: 30.45 ft

Screen Length: 20. ft Well Radius: 0.4167 ft

Initial Displacement: 0.7013 ft

Total Well Penetration Depth: 30.45 ft



CTMW-05D SLUG OUT 1

Data Set: \...\CTMW_05D_slugout_1.aqt

Date: 10/23/17

Time: 09:41:40

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-05D Test Date: 10/05/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.451 ft/day

y0 = 0.5468 ft

AQUIFER DATA

Saturated Thickness: 21. ft

Initial Displacement: 0.6971 ft

Casing Radius: 0.083 ft

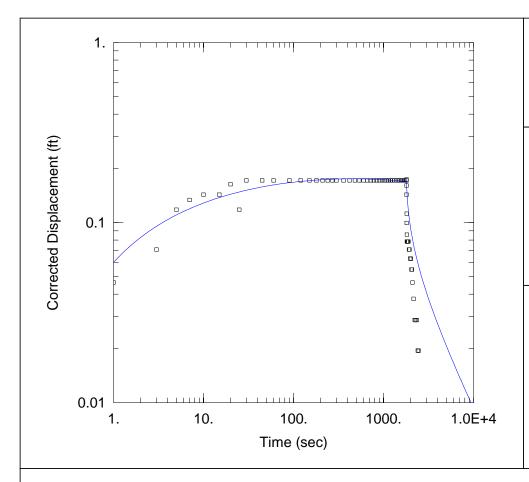
Total Well Penetration Depth: 30.45 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-05D)

Static Water Column Height: 30.45 ft

Screen Length: 20. ft Well Radius: 0.4167 ft



PUMPING TEST FOR CTMW-06S (0.5 L/MIN)

Data Set: \...\CTMW-06S 0.5.aqt

Date: 10/25/17 Time: 14:19:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-06S Test Date: 10/9/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Theis

 $= \frac{41.83}{0.001815} \text{ ft}^2/\text{day}$

S

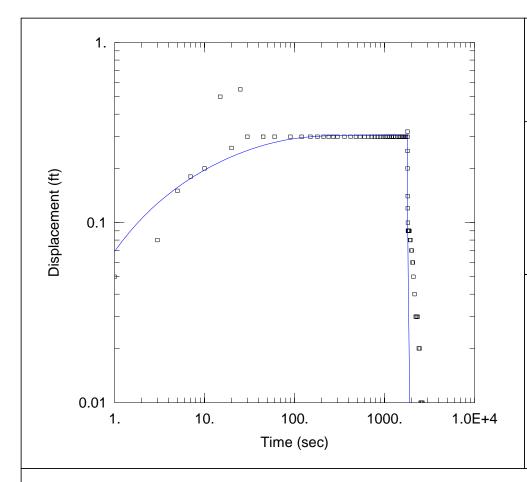
 $Kz/Kr = \overline{0.1}$

 $= \overline{0.35}$ ft

WELL DATA

	Pumping Wells			Observation Wells
Well Name	X (ft)	Y (ft)	Well Name	X (ft)
CTMW-06S	0	0	□ CTMW-06S	0

ll Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
MW-06S	0	0	□ CTMW-06S	0	0



PUMPING TEST FOR CTMW-06S (0.5 L/MIN)

Data Set: \...\CTMW-06S 0.5_Hantush-Jacob.aqt Date: 10/25/17 Time: 14:19:24

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: CTMW-06S Test Date: 10/9/2017

SOLUTION

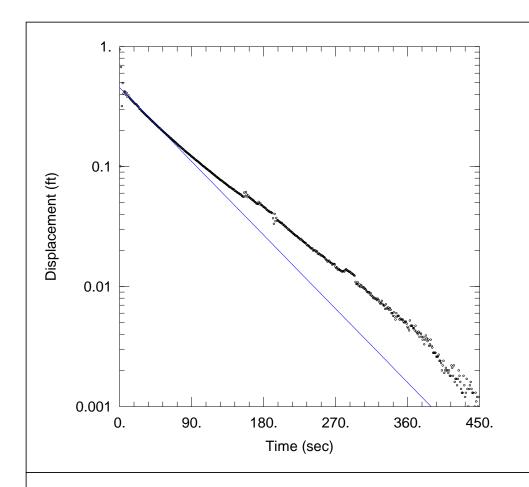
Aquifer Model: <u>Leaky</u> Solution Method: <u>Hantush-Jacob</u>

 $= 31.71 \text{ ft}^2/\text{day}$ $= \overline{0.001}962$

 $r/B = \overline{0.1}$ $Kz/Kr = \overline{0.1}$ = 0.35 ft

WELL DATA

Pumping Wells			Observation Wells			
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)	
CTMW-06S	0	0	□ CTMW-06S	0	0	



CTMW-06D SLUG IN 1

Data Set: \...\CTMW_06D_slugin_1.aqt

Date: <u>10/23/17</u> Time: <u>09:41:54</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-06D
Test Date: 10/04/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9758 ft/dayy0 = 0.4551 ft

AQUIFER DATA

Saturated Thickness: 21. ft Anisotropy Ratio (Kz/Kr): 0.1

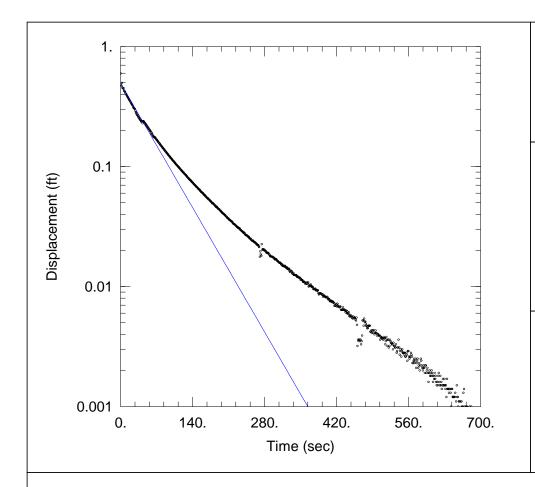
WELL DATA (CTMW-06D)

Static Water Column Height: 31.01 ft

Screen Length: 20. ft Well Radius: 0.4167 ft

Initial Displacement: 0.9452 ft

Total Well Penetration Depth: 31.01 ft



CTMW-06D SLUG OUT 1

Data Set: \...\CTMW_06D_slugout_1.aqt

Date: 10/23/17

Time: 09:42:06

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: CTMW-06D
Test Date: 10/04/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.059 ft/dayy0 = 0.4958 ft

AQUIFER DATA

Saturated Thickness: 21. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CTMW-06D)

Static Water Column Height: 31.01 ft

Screen Length: 20. ft Well Radius: 0.4167 ft

Initial Displacement: 0.5969 ft

Total Well Penetration Depth: 31.01 ft

Chemical Reduction Study



TECHNICAL MEMORANDUM

To:	Arul Ayyaswami, Tetra Tech
Cc:	Carl Lenker and Mike Crews, Tetra Tech
From:	Sonya Cadle, Chris Gutmann, and Ellyn Swenson, Tetra Tech
Date:	October 26, 2017
Subject:	Aquifer Testing Results – AP Area Treatability Study

1.0 INTRODUCTION

This technical memorandum presents the results of the aquifer slug testing and specific capacity tests performed as part of the NERT AP Area Treatability Study hydrogeological evaluation. The slug tests were conducted in the intermediate ("I") and deep ("D") wells, since there was insufficient water in the shallow ("S") wells to permit slug testing. Specific capacity tests were conducted in primarily shallow wells and used to estimate aquifer parameters; one intermediate well was also tested in a similar way to allow direct comparison to slug testing results.

The locations of the wells are shown below. The objective of the aquifer slug and pump testing was to estimate aquifer hydraulic conductivity (K) in the study area before injection testing. Because the shallow alluvial wells had extremely small saturated thicknesses (often less than a foot), the aquifer parameter estimates were extremely dependent on the exact saturated thickness. Hence, these estimates were not considered representative of the overall K of the alluvium but proved useful in estimating potential injection rates.

2.0 SLUG TESTS

Slug testing was performed in August/September 2016, April 2017, and October/November 2017. Well construction information is provided in Table 1. The tests consisted of monitoring water level displacements caused by the insertion or removal of a solid slug from a well. Water level displacement was measured using a Solinst Levelogger Gold M5 pressure transducer, which was programmed to collect data at one-half second time intervals. When the rate of recovery allowed multiple tests, several tests were performed at each well. The size of the slug was selected to be consistent with the diameter of the well.

The slug test data were downloaded from the transducer and the drawdown was calculated from the downloaded data. Several slug tests were selected for analysis from each well. Slug test analysis was performed using the

Tetra Tech, Inc.

commercially-available AQTESOLV software (HydroSOLVE 2007). The Bouwer and Rice (1976) method for analyzing slug tests in an unconfined aquifer was used to estimate hydraulic conductivity. The AQTESOLV interpretation plots are provided as Attachment A. Table 2 summarizes the results of the slug test analysis; the K values provided for each well represent a mean of the K estimates obtained from individual tests at that well. Water levels measured during the testing events are summarized in Table 3.

All tested wells were screened in the Upper Muddy Creek Formation (UMCf). The estimated Ks are generally consistent with the logged lithology of the screened interval of the wells, which was primarily silty sand to sandy silt. Prior estimates of the hydraulic conductivity for the UMCf have ranged from less than 0.01 feet per day (ft/day) to more than 10 ft/day. The estimates from the AP Area slug tests ranged from 0.1 to 15 ft/day, which is consistent with the previous range. In addition, data from the injection testing in the AP Area confirmed that many of the wells were capable of sustaining injection rates of 1-3 gallons per minute each. This injection rate would be consistent with the hydraulic conductivity range estimated from slug testing.

In some of the wells tested, the screened interval included both coarser- and finer-grained zones. Because the lithology at the tested wells was logged by collecting 1.5 feet of core for every 5 feet of hole, it is also possible that coarser-grained zones were present in other wells but were not encountered in the sampled material. In cases where both zones of fine- and coarse-grained material were present, the coarser zones would be expected to be the primary flow zones and to dominate the K estimates.

Many factors can affect slug test results. In considering whether the K from a slug test is representative of the overall formation K, the values estimated from slug tests are strongly influenced by factors such as a low-K well skin, drilling-induced disturbances, highly anisotropic formations, and the quality of well development (Butler 1998, Hyder and Butler 1995). Other possible factors could include non-instantaneous or incomplete slug removal, accidental transducer or slug movement after the test began, and others. However, in general, the individual slug tests analyzed were very consistent within each well.

3.0 SPECIFIC CAPACITY TESTS

Specific capacity tests were performed in several shallow wells with saturated thicknesses that were too thin to test using a solid slug. In addition, a specific capacity test was performed in one intermediate well for comparison with the slug test results. Each well was pumped for 20-30 minutes and then allowed to recover. Because of pump limitations, the pumping rate varied somewhat during the test. Table 4 provides a summary of specific capacity test analytical results, and the AQTESOLV printouts are provided in Attachment A.

The specific capacity test performed in intermediate well UFIW-06I was analyzed using the Theis (1935) method for the drawdown and the Hantush (1960) leaky aquifer solution for recovery. Comparison between Tables 2 and 4 shows that the values of K obtained from the specific capacity tests and slug tests at this location were similar.

Most specific capacity tests were analyzed using the Theis (1935) method, Hantush (1960) leaky aquifer solution, or Cooper-Jacob (1946) unconfined solution. The very low saturated thickness at these locations means that the resulting K estimates only apply to the small saturated zone of alluvium immediately overlying the UMCf; they are not likely to be representative of the overall K of the alluvium. In fact, at one well (UFIW-04S) the saturated thickness was so small that the water level drew down to the pump intake within the first couple seconds and then sustained that level with a tiny flow rate for the next 30 minutes. The resulting data could not be analyzed because there were only a couple data points documenting the drawdown and recovery.

4.0 COMPARISON BEFORE AND AFTER INJECTIONS

Treatability study-related injections began after the August/September 2016 aquifer testing event was completed. Several wells were tested in April and October/November 2017 after all injections were completed in order to

assess whether the injections had potentially influenced K. The K estimates from the pre-injection (August/September 2016) and post-injection (April and October/November 2017) tests are provided in Table 2.

Based on the data collected before and after injection, a decrease in K occurred in several injection wells tested:

- UFIW-01I and UFIW-04I showed a decrease in K of about an order of magnitude.
- UFIW-05I and UFIW-08I showed a small potential decrease in K, but by less than an order of magnitude.

However, monitoring wells tested before and after injection showed no significant changes in the estimated K; in fact, the K estimates were nearly identical in many cases. Thus, any decrease in K associated with injection testing was very likely limited to the immediate vicinity of the injection wells.

5.0 REFERENCES

- Bouwer, H. and Rice, R.C., 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research*, vol. 12, no. 3, pp. 423-428.
- Butler, James J. Jr., 1998. The Design, Performance, and Analysis of Slug Tests., CRC Press LLC, 252 pages.
- Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.
- Hantush, M.S., 1960. Modification of the theory of leaky aquifers, Jour. of Geophys. Res., vol. 65, no. 11, pp. 3713-3725.
- Hantush, M.S. and C.E. Jacob, 1955. Non-steady radial flow in an infinite leaky aquifer, Am. Geophys. Union Trans., vol. 36, pp. 95-100.
- Hyder, Z. and Butler, J.J. Jr., 1995. Slug tests in unconfined formations: an assessment of the Bouwer and Rice technique, Ground Water, vol. 33, no. 1, pp. 16-22.
- HydroSOLVE, Inc., 2007. AQTESOLV version 4.50 Professional. Developed by Glenn M. Duffield
- Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524

Table 1: Well Construction Information AP Area Treatability Study, Henderson, Nevada

Well ID	UMCf Screened		Top of	Well	Slug Dimensions		
	Contact	Interval (feet	Casing	Diameter	Diameter	Length	
	(feet bgs)	bgs)	(feet amsl)	(inches)	(inches)	(feet)	
UFIW-01S	28	23 - 28	1,755.11	2			
UFIW-01I	28	33 - 38	1,755.08	2	1.66	5	
UFIW-01D	28	43 - 48	1,755.21	2	1.66	5	
UFIW-02S	28	23 - 28	1,754.97	2			
UFIW-02I	28	31 - 41	1,754.85	2	1.66	5	
UFIW-02D	28	43 - 48	1,755.01	2	1.66	5	
UFIW-03S	30	25 - 30	1,755.22	2			
UFIW-03I	30	35 - 40	1,754.89	2	1.66	5	
UFIW-03D	30	45 - 50	1,755.38	2	1.66	5	
UFIW-04S	28	23 - 28	1,755.28	2			
UFIW-04I	28	33 - 38	1,755.33	2	1.66	5	
UFIW-04D	28	43 - 48	1,755.39	2	1.66	5	
UFIW-05S	29.5	24.5 - 29.5	1,759.63	2			
UFIW-05I	29.5	34.5 - 39.5	1,759.71	2	1.66	5	
UFIW-05D	29.5	44.5 - 49.5	1,759.78	2	1.66	5	
UFIW-06S	32	27 - 32	1,759.76	2			
UFIW-06I	32	35 - 45	1,759.71	2	1.66	5	
UFIW-06D	32	47 - 52	1,759.85	2	1.66	5	
UFIW-07S	31	26 - 31	1,759.76	2			
UFIW-07I	31	36 - 41	1,759.63	2	1.66	5	
UFIW-07D	31	46 - 51	1,759.79	2	1.66	5	
UFIW-08S	30	25 - 30	1,759.60	2			
UFIW-08I	30	35 - 40	1,759.61	2	1.66	5	
UFIW-08D	30	46-51	1,759.77	2	1.66	5	
UFMW-01S	29	24 - 29	1,755.07	2			
UFMW-01I	29	34 - 39	1,755.03	2	1.66	5	
UFMW-01D	29	44 - 49	1,755.12	2	1.66	5	
UFMW-02S	29	24 - 29	1,755.02	2			
UFMW-02I	29	34 - 39	1,755.05	2	1.66	5	
UFMW-02D	29	44 - 49	1,755.02	2	1.66	5	
UFMW-03S	26	21 - 26	1,754.68	2			
UFMW-03I	26	30 - 40	1,754.70	2	1.66	5	
UFMW-03D	26	45 - 50	1,754.77	2	1.66	5	
UFMW-04S	29	24 - 29	1,758.79	2			
UFMW-04I	29	34 - 39	1,758.84	2	1.66	5	
UFMW-04D	29	44 - 49	1,758.83	2	1.66	5	
UFMW-05S	30	25 - 30	1,758.94	2			
UFMW-05I	30	35 -40	1,758.92	2	1.66	5	
UFMW-05D	30	45 - 50	1,758.91	2	1.66	5	
UFMW-06S	30	25 - 30	1,758.74	2			
UFMW-06I	30	35 -40	1,758.71	2	1.66	5	
UFMW-06D	30	45 - 50	1,758.76	2	1.66	5	
E1-1	27	22 - 47	1,754.43	6	4.5	6.3	
E1-2	27.5	22.5 - 47.5	1,754.46	6	4.5	6.3	
E1-3	27	22 - 47	1,754.62	6	4.5	6.3	
E2-1	31	26 - 51	1,757.32	6	4.5	6.3	
E2-2	33	28 - 53	1,757.62	6	4.5	6.3	
E2-3	32	27 - 52	1,758.05	6	4.5	6.3	
E2-4	29	24 - 49	1,758.11	6	4.5	6.3	
E2-5	34	28 - 53	1,758.12	6	4.5	6.3	
Notes:							

Shallow "S" wells were not tested because the saturated thickness was too small to support slug testing.

bgs - below ground surface amsl - above mean sea level UMCf - Upper Muddy Creek Formation

Table 2: Slug Test Results AP Treatability Study, Henderson, Nevada

Mean Hydraulic Conductivity							
Well Date Cor		Condu	ctivity	Logged Lithology of Screened Interval			
		(feet/day)	(cm/sec)				
1151/4/ 041	8/16/2016	9.7		Sandy silt, fine to medium sand			
UFIW-01I	4/11/2017 11/2/2017	0.3 1.4		Sandy silt, fine to medium sand Sandy silt, fine to medium sand			
UFIW-01D	8/16/2016	1.9		Sandy silt, fine to medium sand Sandy silt, fine sand, small caliche nodules			
UFIW-02I	8/17/2016	1.0		Sandy silt, fine sand, silt nodule			
UFIW-02D	8/16/2016	1.4		Sandy silt, fine sand			
UFIW-03I	8/17/2016	11.3		Sandy silt, fine sand			
UFIW-03D	8/17/2016	7.3	2.58E-03	Sandy silt, fine sand			
	8/17/2016	12.9		Sandy silt, fine sand			
UFIW-04I	4/11/2017	1.3		Sandy silt, fine sand			
	11/2/2017	1.9		Sandy silt, fine sand			
UFIW-04D	8/17/2016	4.6		Sandy silt, fine sand			
LIEDAL OF	8/18/2016	4.9		Sandy silt, fine sand			
UFIW-05I	4/11/2017 11/2/2017	2.2 0.9		Sandy silt, fine sand Sandy silt, fine sand			
UFIW-05D	8/18/2016	0.5		Silt with clay, some sand			
UFIW-06I	8/18/2016	2.5		Sandy silt, fine sand			
UFIW-06D	8/18/2016	0.9		Silt with sand, very fine sand			
UFIW-07I	8/18/2016	3.7		Silt with sand, fine grained sand			
UFIW-07D	8/18/2016	2.1	7.23E-04	Silt with sand, fine sand			
	8/18/2016	2.7	9.39E-04	Silty sand, fine sand, some small caliche chunks			
UFIW-08I	4/11/2017	0.4		Silty sand, fine sand, some small caliche chunks			
	11/2/2017	0.3		Silty sand, fine sand, some small caliche chunks			
UFIW-08D	8/29/2016	1.2		Silt with sand and caliche; silt			
	8/17/2016	1.3		Sandy silt, fine sand			
UFMW-01I	4/11/2017	1.9		Sandy silt, fine sand			
	10/6/2017	1.9		Sandy silt, fine sand			
UFMW-01D	8/17/2016 10/6/2017	1.8		Sandy silt, fine sand Sandy silt, fine sand			
	8/17/2016	3.0 1.0		Sandy silt, fine sand Sandy silt, fine sand			
UFMW-02I	10/6/2017	1.1		Sandy silt, fine sand			
	8/17/2016	1.1		Sandy silt, increasing sand content			
UFMW-02D	10/6/2017	1.4		Sandy silt, increasing sand content			
	8/17/2016	1.8		Sandy silt, fine sand			
UFMW-03I	4/11/2017	1.6		Sandy silt, fine sand			
	10/6/2017	1.8	6.32E-04	Sandy silt, fine sand			
UFMW-03D	8/17/2016	1.5		Sandy silt, fine sand			
01 WW 00B	10/6/2017	1.8		Sandy silt, fine sand			
	8/29/2016	2.6		Silty sand, fine sand			
UFMW-04I	4/11/2017	3.4		Silty sand, fine sand			
	10/5/2017 8/29/2016	4.8 4.6		Silty sand, fine sand Silty sand, fine sand, caliche nodules			
UFMW-04D	10/5/2017	5.4		Silty sand, fine sand, caliche nodules			
	8/29/2016	1.1		Sandy silt, fine sand, little caliche nodules			
UFMW-05I	10/6/2017	1.9		Sandy silt, fine sand, little caliche nodules			
LIENAM OFF	8/19/2016	4.3		Sandy silt, fine sand			
UFMW-05D	10/6/2017	5.1		Sandy silt, fine sand			
	8/29/2016	3.2	1.12E-03	Sandy silt, fine sand			
UFMW-06I	4/11/2017	3.1	1.11E-03	Sandy silt, fine sand			
	10/5/2017	4.8	1.70E-03				
UFMW-06D	8/29/2016	1.2		Sandy silt, fine sand			
	10/5/2017	1.0		Sandy silt, fine sand			
E1-1	8/30/2016	2.0		Sand and sand with gravel (4 ft); sandy silt (21 ft)			
E1-2	8/30/2016	0.5		Sand and sand with gravel (5 ft); sandy silt (20 ft)			
E1-3	8/30/2016	0.4		Silty sand (5 ft); sandy silt (20 ft)			
E2-1 E2-2	8/30/2016	2.0		Silty sand (5 ft); silt (20 ft) Silty sand (5 ft); silt to sandy silt (20 ft)			
E2-2 E2-3	8/30/2016 8/30/2016	3.7		1E-03 Silty sand (5 ft); silt (0 sandy silt (20 ft)			
E2-3	8/30/2016	2.7		.61E-04 Silty sand (5 ft); silt (20 ft)			
E2-5	8/30/2016	0.7		Silty sand (5 ft); silt (20 ft)			
Notes:				1 - 7 (7) (7)			

Notes:

cm/sec - centimeters per second

1 of 2

Table 3: Water Levels AP Area Treatability Study, Henderson, Nevada

Well ID			Total Depth	Water Level
UFIW-011 4/11/2017 38.15 27.2 UFIW-01D 8/16/2016 48.09 27.83 UFIW-02I 8/17/2016 41.1 27.18 UFIW-02I 8/17/2016 41.1 27.18 UFIW-03I 8/17/2016 40.27.00 UFIW-03B 8/17/2016 50.35 27.43 UFIW-03I 8/17/2016 50.35 27.43 UFIW-04I 4/11/2017 38.4 26.49 11/2/2017 38.4 26.49 11/2/2017 38.4 26.49 11/2/2017 38.4 26.79 UFIW-04D 8/17/2016 39.13 28.07 UFIW-05I 4/11/2017 39.31 27.11 11/2/2017 39.31 27.11 11/2/2017 39.31 28.27 UFIW-05D 8/18/2016 49.47 28.48 UFIW-06B 8/18/2016 44.73 28.15 UFIW-06 8/18/2016 51.55 28.70 UFIW-07 8/18/2016 51.55 28.70 UFIW-07 8/18/2016 51.20 28.38 UFIW-08 8/18/2016 51.20 28.38 UFIW-08 8/18/2016 51.20 28.38 UFIW-08 8/18/2016 51.20 28.38 UFIW-08 8/18/2016 51.20 28.38 UFIW-09 8/18/2016 51.20 28.38 UFIW-08 8/18/2016 51.20 28.38 UFIW-09 8/18/2016 50.375 UFIW-09 8/18/2016 50.375 UFIW-09 8/18/2016 50.38 UFIW-09 8/18/2018 UFIW-09 8/18/2018 UFIW-09 8/18/2018 UFIW-09 8/18/2018 UFIW-09 8/18/2018	Well ID	Date		
UFIW-011		8/16/2016		
UFIW-01D	UFIW-01I		38.15	
UFIW-02I 8/17/2016 41.1 27.18 UFIW-02D 8/16/2016 48.55 27.45 UFIW-03I 8/17/2016 50.35 27.43 UFIW-03D 8/17/2016 50.35 27.43 8/17/2016 38.21 27.44 UFIW-04I 4/11/2017 38.4 26.49 11/2/2017 38.4 26.49 UFIW-04D 8/17/2016 47.97 27.49 8/18/2016 39.13 28.07 UFIW-05I 4/11/2017 39.31 28.27 UFIW-06I 8/18/2016 49.47 28.48 UFIW-06I 8/18/2016 44.73 28.15 UFIW-07D 8/18/2016 41.12 28.03 UFIW-07D 8/18/2016 41.12 28.03 UFIW-07D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.20 28.38 8/18/2016 39.75 28.05 UFIW-08I 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 UFIW-08D 8/29/2016 50 28.27 UFIW-01 4/11/2017 39.3 28.43 UFIW-01 10/6/2017 29.57 UFMW-01 8/17/2016 49.00 28.08 10/6/2017 29.57 UFMW-02 8/17/2016 49.00 28.08 10/6/2017 29.57 UFMW-03 4/11/2017 40.25 26.39 UFMW-03 4/11/2017 40.25 26.39 UFMW-03 4/11/2017 28.75 UFMW-04 4/11/2017 28.75 UFMW-05 4/11/2017 28.75 UFMW-06 50/2017 28.75 UFMW-07 50/2017 29.57 UFMW-08 50/2016 49.00 28.08 10/6/2017 29.77 UFMW-09 50/2017 29.77 UFMW-09 50/2017 30.41 UFMW-09 50/2017 29.77 UFMW-09 50/2016 49.00 28.08 10/6/2017 29.77 UFMW-01 4/11/2017 39.3 27.75 UFMW-03 50/2016 48.96 27.98 UFMW-04 4/11/2017 28.75 UFMW-05 50/2017 28.75 UFMW-06 6/2017 28.75 UFMW-07 50/2017 28.75 UFMW-08 50/2016 49.55 27.77 UFMW-09 50/2016 49.55 27.77 UFMW-06 6/2017 28.75 UFMW-06 6/2017 28.75 UFMW-07 50/2017 28.75 UFMW-08 50/2016 49.55 27.77 UFMW-08 50/2016 49.55 27.77 UFMW-09 50/2016 49.67 27.75 UFMW-09 6/2017 28.85 UFMW-09 6/2017 28.85 UFMW-09 6/2010 49.81 27.76 UFMW-09 6/2017 28.85 UFMW-09 6/2017 28.85 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2017 28.85 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2017 28.85 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2017 28.85 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2016 49.67 27.75 UFMW-09 6/2017 28.95 E1-1 8/30/2016 49.67 27.76 UFMW-09 6/2017 28.95 E1-2 8/30/2016 49.67 27.76 E1-2 8/30/2016 55.25 E2-3 8/30/2016 55.25 E2-4 8/30/		11/2/2017	38.15	29.23
UFIW-02D 8/16/2016 48.55 27.45 UFIW-03I 8/17/2016 50.35 27.43 8/17/2016 38.21 27.44 UFIW-04I 4/11/2017 38.4 26.49 11/2/2017 38.4 28.79 UFIW-04D 8/17/2016 47.97 27.49 8/18/2016 39.13 28.07 UFIW-05I 4/11/2017 39.31 27.11 11/2/2017 39.31 28.27 UFIW-05I 4/11/2017 39.31 28.07 UFIW-06I 8/18/2016 49.47 28.48 UFIW-06I 8/18/2016 44.73 28.15 UFIW-07D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.20 28.38 8/18/2016 39.75 28.05 UFIW-08I 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 UFIW-081 4/11/2017 40 27.17 UFIW-081 4/11/2017 39.3 28.43 UFIW-091 8/18/2016 50 28.27 UFIW-091 8/17/2016 49.00 28.08 10/6/2017 29.57 UFMW-01 10/6/2017 29.7 UFMW-02 10/6/2017 30.41 UFMW-03 4/17/2016 48.96 27.98 UFMW-03 4/11/2017 40.25 26.39 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03 6/2017 28.75 8/17/2016 39.51 27.74 UFMW-04 4/11/2017 39.6 26.7 UFMW-05 8/29/2016 39.51 27.74 UFMW-06 4/12/2017 28.75 UFMW-07 4/11/2017 28.75 UFMW-08 6/2017 28.75 UFMW-09 8/29/2016 39.69 27.85 UFMW-09 6/2017 28.75 UFMW-09 7/10/6/2017 28.75 UFMW-09 8/29/2016 39.69 27.85 UFMW-09 8/29/2016 39.69 27.85 UFMW-09 8/29/2016 39.69 27.85 UFMW-09 8/29/2016 39.82 27.49 UFMW-06 4/1/2017 28.85 UFMW-06 8/29/2016 39.82 27.49 UFMW-06 4/1/2017 28.85 UFMW-07 49/2016 49.81 UFMW-08 8/29/2016 49.81 UFMW-08 8/29/2016 49.81 UFMW-08 8/29/2016 39.82 27.49 UFMW-09 8/29/2016 49.81 UFMW-08 8/29/2016 49.81 UFMW-09 8/29/	UFIW-01D	8/16/2016	48.09	27.83
UFIW-031 8/17/2016 50.35 27.43	UFIW-02I	8/17/2016		27.18
UFIW-03D	UFIW-02D	8/16/2016	48.55	27.45
UFIW-04			40	27.00
UFIW-04I UFIW-04I UFIW-04D 4/11/2017 38.4 26.49 11/2/2017 38.4 26.49 11/2/2017 38.4 28.79 UFIW-04D 8/17/2016 47.97 27.49 8/18/2016 39.13 28.07 UFIW-05I 11/2/2017 39.31 28.27 UFIW-05D 8/18/2016 49.47 28.48 UFIW-06I 8/18/2016 44.73 28.15 UFIW-06I 8/18/2016 51.55 28.70 UFIW-07I 8/18/2016 51.55 28.70 UFIW-07I 8/18/2016 51.50 28.38 UFIW-08I 4/11/2017 40 28.18 UFIW-08I 8/18/2016 51.20 28.38 UFIW-08I 8/18/2016 51.20 28.38 UFIW-08I 8/18/2016 51.20 28.38 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 8/17/2016 39.24 27.81 UFMW-011 10/6/2017	UFIW-03D	8/17/2016	50.35	27.43
UFIW-04I H1/2/2017 38.4 28.79 UFIW-04D 8/17/2016 47.97 27.49 8/18/2016 39.13 28.07 UFIW-05I 4/11/2017 39.31 27.11 11/2/2017 39.31 28.27 UFIW-05D 8/18/2016 49.47 28.48 UFIW-06I 8/18/2016 44.73 28.15 UFIW-06I 8/18/2016 44.73 28.15 UFIW-07I 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.20 28.38 8/18/2016 39.75 28.05 UFIW-08I 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 UFIW-08D 8/29/2016 50 28.27 UFIW-011 4/11/2017 39.3 28.43 UFIW-010 8/18/2016 49.00 28.08 10/6/2017 29.57 UFMW-011 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 10/6/2017 28.75 UFMW-04D 4/11/2017 39.6 27.32 UFMW-04D 5/2017 28.75 UFMW-05D 10/6/2017 28.75 UFMW-04D 4/11/2016 50.36 27.32 UFMW-05D 10/6/2017 28.75 UFMW-05D 10/6/2017 28.61 UFMW-05D 10/6/2017 28.61 UFMW-05D 10/6/2017 28.87 UFMW-06D 10/6/2017 2			38.21	27.44
UFIW-04D 8/17/2016 47.97 27.49	UFIW-04I		38.4	26.49
UFIW-04D			38.4	
UFIW-05 4/11/2017 39.31 27.11 11/2/2017 39.31 28.27 28.48 UFIW-05D 8/18/2016 44.73 28.48 UFIW-06D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.20 28.38 3/18/2016 39.75 28.05 UFIW-07D 8/18/2016 39.75 28.05 UFIW-08D 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 8/17/2016 39.24 27.81 UFIW-01D 8/17/2016 49.00 28.08 10/6/2017 29.57	UFIW-04D			
UFIW-05I 4/11/2017 39.31 27.11 11/2/2017 39.31 28.27 UFIW-05D 8/18/2016 49.47 28.48 UFIW-06D 8/18/2016 44.73 28.15 UFIW-06D 8/18/2016 51.55 28.70 UFIW-07D 8/18/2016 51.55 28.03 UFIW-07D 8/18/2016 51.20 28.38 8/18/2016 39.75 28.05 UFIW-08D 8/18/2016 50 28.28 8/17/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 8/17/2016 39.24 27.81 UFMW-01I 4/11/2017 39.3 28.43 10/6/2017 29.57 UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02I 8/17/2016 48.96 27.98 10/6/2017 30.41 UFMW-03I <td></td> <td></td> <td></td> <td></td>				
11/2/2017 39.31 28.27	UFIW-05I			
UFIW-05D				
UFIW-06I 8/18/2016 44.73 28.15 UFIW-06D 8/18/2016 51.55 28.70 UFIW-07I 8/18/2016 51.55 28.30 UFIW-07D 8/18/2016 51.20 28.38 8/18/2016 39.75 28.05 UFIW-08I 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 8/17/2016 39.24 27.81 UFIW-01I 4/11/2017 39.3 28.43 10/6/2017 29.57 29.57 UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.75 10/6/2017 28.61 10/5/2017 28.61 10/5/2017 28.75 10/6/2017 28.61 10/5/2017 28.75 10/6/2017 28.75 10/6/2017 28.61 10/5/2017 28.75 10/6/2017 28.83 8/29/2016 39.69 27.85 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-05D 8/29/2016 49.67 27.75 10/5/2017 28.83 8/29/2016 39.82 27.49 UFMW-06D 8/29/2016 49.81 27.76 10/5/2017 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-3 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-3 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-3 8/30/2	UFIW-05D			
UFIW-06D				
UFIW-07I				
UFIW-07D 8/18/2016 51.20 28.38 UFIW-08I 8/18/2016 39.75 28.05 UFIW-08D 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 B/17/2016 39.24 27.81 UFMW-01I 4/11/2017 39.3 28.43 10/6/2017 29.57 UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.41 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 10/6/2017 28.77 UFMW-04I <				
UFIW-08I				
UFIW-08I 4/11/2017 40 27.17 11/2/2017 40 28.18 UFIW-08D 8/29/2016 50 28.27 WFMW-01D 8/17/2016 39.24 27.81 UFMW-01D 4/11/2017 39.3 28.43 10/6/2017 29.57 UFMW-01D 10/6/2017 29.7 UFMW-02I 10/6/2017 29.7 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.41 UFMW-02D 10/6/2017 30.47 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 4/11/2017 39.6 27.32 10/6/2017 28.67 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-	01100-0710			
UFIW-08D				
UFIW-08D 8/29/2016 50 28.27 WFMW-011 8/17/2016 39.24 27.81 UFMW-01D 4/11/2017 39.3 28.43 10/6/2017 29.57 UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-021 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 WFMW-03D 4/11/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 UFMW-05I 8/29/2016 39.69 27.85	01 100-001			
UFMW-011	LIEIM OOD			
UFMW-011 4/11/2017 39.3 28.43 10/6/2017 29.57 UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02I 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.75 UFMW-03D 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 39.51 27.74 UFMW-04D 8/29/2016 39.69 27.85 UFMW-05I 8/29/2016 39.69 27.85 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017	0F1VV-06D			
10/6/2017 29.57	LIEM_01I			
UFMW-01D 8/17/2016 49.00 28.08 10/6/2017 29.7 UFMW-02I 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.75 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 28.83 8/29/2016 49.67 27.75 10/6/2017 28.83	OI WWW-OII		39.3	
UFMW-01D 10/6/2017 29.7 UFMW-02I 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 WFMW-03D 8/17/2016 40.27 27.05 UFMW-03D 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.75 UFMW-04D 8/29/2016 39.51 27.74 UFMW-04D 8/29/2016 39.51 27.74 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.61 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 8/19/2016 49.67 27.75 UFMW-05D 8/19/2016 49.67 27.75 UFMW-06D 4/1/2017 39.9 26.56			40.00	
UFMW-02I 8/17/2016 38.99 27.75 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 WFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 WFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 39.51 27.77 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 28.83 49/19/2016 49.67 27.75 10/6/2017 28.83 WFMW-06I 49.67 27.75 10/5/2017 28.57 UFMW-06	UFMW-01D			
UFMW-02D 10/6/2017 30.41 UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 8/29/2016 39.51 27.74 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107				
UFMW-02D 8/17/2016 48.96 27.98 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 8/29/2016 39.51 27.74 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.61 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.95 E1-1 8/30/2016 49.81 27.76	UFMW-02I		30.99	
UFMW-02D 10/6/2017 30.47 8/17/2016 40.27 27.05 UFMW-03I 4/11/2017 40.25 26.39 10/6/2017 28.75 UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 8/29/2016 39.51 27.74 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95			18.06	
UFMW-03I	UFMW-02D		40.90	
UFMW-031			40.27	
10/6/2017 28.75	LIEMWA OSI			
UFMW-03D 8/17/2016 50.36 27.32 10/6/2017 28.77 8/29/2016 39.51 27.74 UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/20	0FWW-031		40.25	
UFMW-04D			E0.26	
UFMW-04I 8/29/2016 39.51 27.74 UFMW-04D 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 WFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3	UFMW-03D		50.50	
UFMW-04I 4/11/2017 39.6 26.7 10/5/2017 28.61 UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 WFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 45.56 27.7 E1-2 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 48.43 27.4 E2-5				
10/5/2017 28.61	LIEMWA OAL			
UFMW-04D 8/29/2016 49.55 27.77 10/5/2017 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 47.52 27.61 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71	UFIVIVV-041			
UFMW-04D 10/5/2017 28.75 UFMW-05I 8/29/2016 39.69 27.85 10/6/2017 29.03 UFMW-05D 8/19/2016 49.67 27.75 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 47.52 27.61 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
UFMW-051	UFMW-04D	000.0	49.55	
UFMW-05D			20.60	
UFMW-05D	UFMW-05I			
UFMW-05D 10/6/2017 28.83 8/29/2016 39.82 27.49 UFMW-06I 4/1/2017 39.9 26.56 10/5/2017 28.57 UFMW-06D 8/29/2016 49.81 27.76 10/5/2107 28.95 E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 47.52 27.61 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
UFMW-06I	UFMW-05D			
UFMW-06I				
10/5/2017 28.57	LIENAVA COS			
UFMW-06D	0FIVIVV-061			
Tol. Tol. Tol. Tol. Tol.				
E1-1 8/30/2016 45.56 27.7 E1-2 8/30/2016 47.52 27.61 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71	UFMW-06D			
E1-2 8/30/2016 47.52 27.61 E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71	F4.4			
E1-3 8/30/2016 46.72 27.64 E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
E2-1 8/30/2016 51.58 26.93 E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
E2-2 8/30/2016 52.12 26.98 E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
E2-3 8/30/2016 49.12 27.32 E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
E2-4 8/30/2016 48.43 27.4 E2-5 8/30/2016 55.25 27.71				
E2-5 8/30/2016 55.25 27.71				
<u> </u>				
		8/30/2016	55.25	27.71

btoc - below top of casing

1 of 2

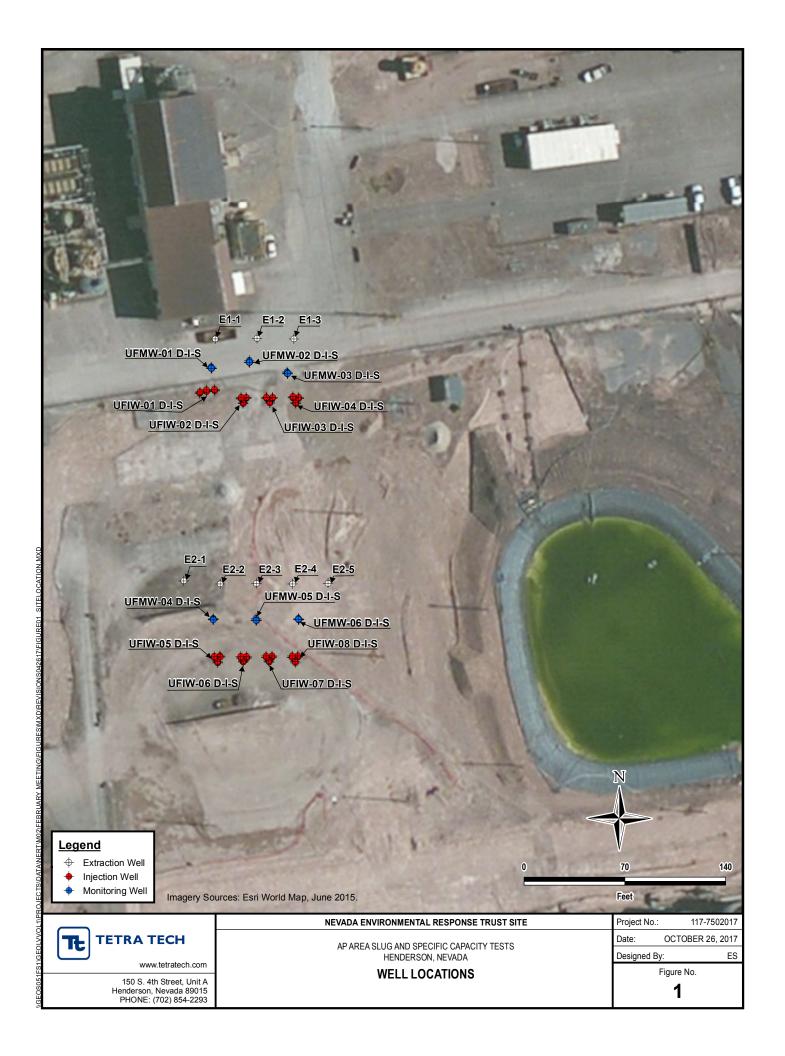
Table 4: Specific Capacity Test Results, AP Area Treatability Study, Henderson, Nevada

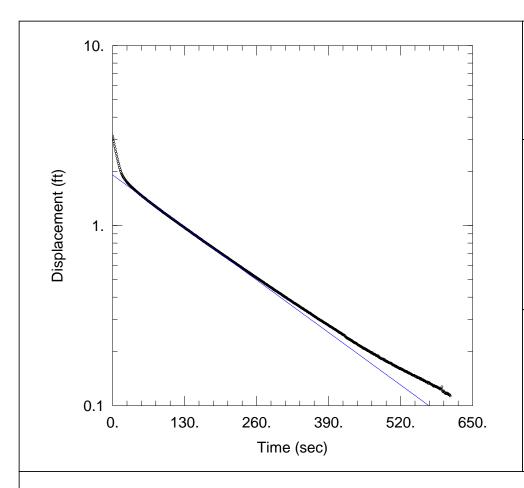
			Estimated Hydrauli	c Conductivi		
Well	Date	Analysis Type				Logged Lithology of Screened Interval
			Saturated Thickness (ft)	(feet/day)	(cm/sec)	interval
UFIW-06S	9/15/2016	Theis, Unconfined	3.41	11	4.03E-03	Sand with gravel and silt
UFIVV-063	9/15/2016	Theis, Unconfined	3.41	4.5	1.59E-03	Sand with gravel and silt
UFIW-06I	9/15/2016	Hantush-Jacob, Leaky	11	1.0	3.64E-04	Sandy silt, fine sand
05100-001	9/15/2016	Theis, Unconfined	11	0.6	2.01E-04	Sandy silt, fine sand
UFMW-05S	10/10/2017	Cooper-Jacob, Unconfined	1.22	16.8	5.93E-03	Silty sand within screened interval, some variance between silty sand with gravel and silty sand with fine sand
UFMW-06S	10/10/2017	Cooper-Jacob, Unconfined	1.71	15.6	5.50E-03	Silty sand with interbedded sand

1 of 2

Notes:

cm/sec - centimeters per second





E1-1 SLUG OUT 1

Data Set: T:\...\E1-1_slugout_1.aqt

Date: 05/04/17 Time: 09:19:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E1-1

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.011 ft/day

 $y0 = \overline{1.911}$ ft

AQUIFER DATA

Saturated Thickness: 19.3 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (E1-1)

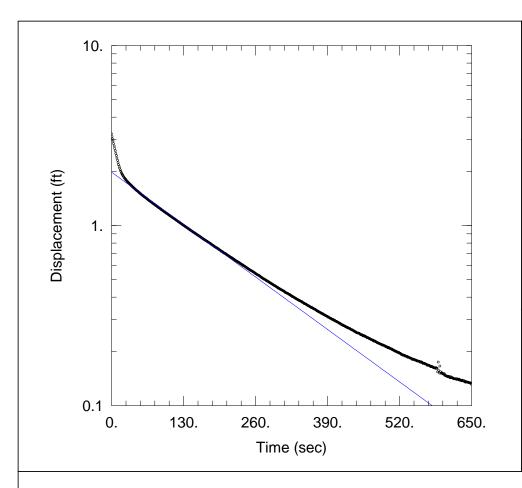
Initial Displacement: 3. ft

Total Well Penetration Depth: 19.3 ft

Static Water Column Height: 17.9 ft

Screen Length: 19.3 ft

Screen Length: 19.3 ft Well Radius: 0.5 ft



E1-1 SLUG OUT 2

Data Set: T:\...\E1-1_slugout_2.aqt

Date: 05/04/17 Time: 09:19:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E1-1

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.009 ft/day

y0 = 1.981 ft

AQUIFER DATA

Saturated Thickness: 19.3 ft Anisotropy Ratio (Kz/Kr): 0.1

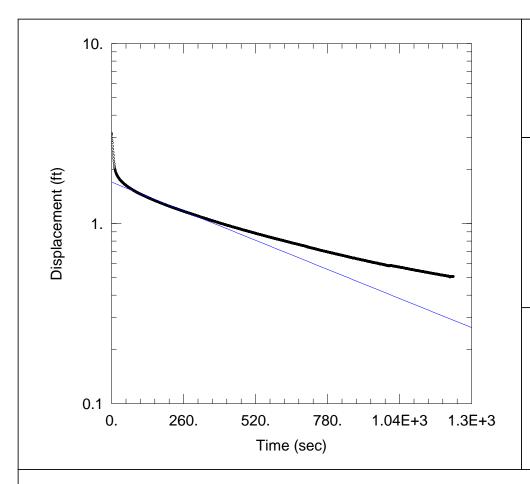
WELL DATA (E1-1)

Static Water Column Height: 17.9 ft

Screen Length: 19.3 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 19.3 ft



E1-2 SLUG OUT 1

Data Set: T:\...\E1-2_slugout_1.aqt

Date: 05/04/17 Time: 09:19:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E1-2

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.5456 ft/day

y0 = 1.7 ft

AQUIFER DATA

Saturated Thickness: 19.89 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (E1-2)

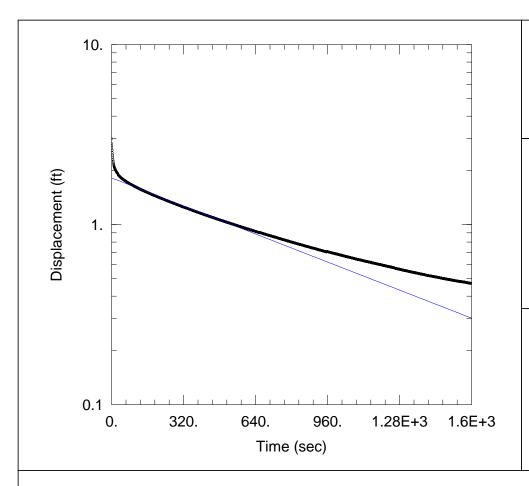
Initial Displacement: 3. ft

Total Well Penetration Depth: 19.89 ft

Static Water Column Height: 19.9 ft

Screen Length: 19.89 ft

Screen Length: 19.89 ft Well Radius: 0.5 ft



E1-3 SLUG OUT 1

Data Set: T:\...\E1-3_slugout_1.aqt

Date: 05/04/17 Time: 09:19:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: <u>E1-3</u> Test Date: <u>8/30/2016</u>

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4355 ft/dayy0 = 1.817 ft

yo – <u>1.017</u> 1

AQUIFER DATA

Saturated Thickness: 19.36 ft Anisotropy Ratio (Kz/Kr): 0.1

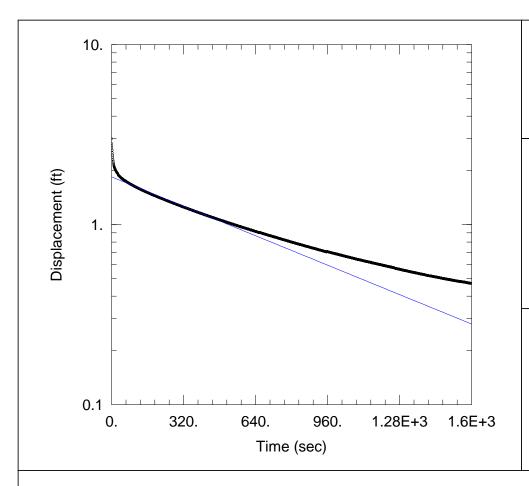
WELL DATA (E1-3)

Static Water Column Height: 19.1 ft

Screen Length: 19.36 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 19.36 ft



E1-3 SLUG OUT 1

Data Set: T:\...\E1-3_slugout_2.aqt

Date: 05/04/17 Time: 09:19:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: <u>E1-3</u> Test Date: <u>8/30/2016</u>

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.457 ft/dayy0 = 1.841 ft

AQUIFER DATA

Saturated Thickness: 19.36 ft Anisotropy Ratio (Kz/Kr): 0.1

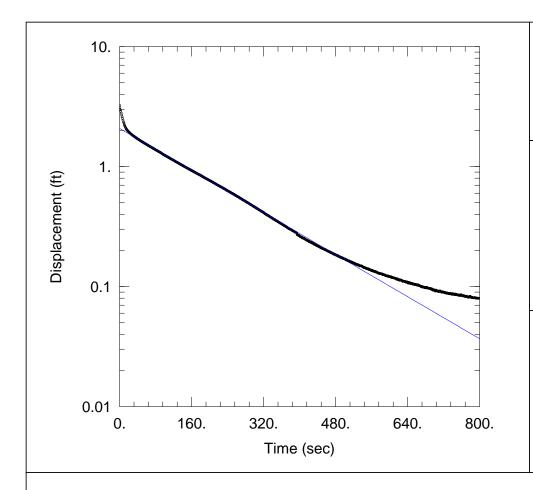
WELL DATA (E1-3)

Static Water Column Height: 19.1 ft

Screen Length: 19.36 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 19.36 ft



E2-1 SLUG OUT 1

Data Set: T:\...\E2-1_slugout_1.aqt

Date: 05/04/17 Time: 09:20:01

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-1

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.318 ft/day

y0 = 2.081 ft

AQUIFER DATA

Saturated Thickness: 24.1 ft Anisotropy Ratio (Kz/Kr): 0.1

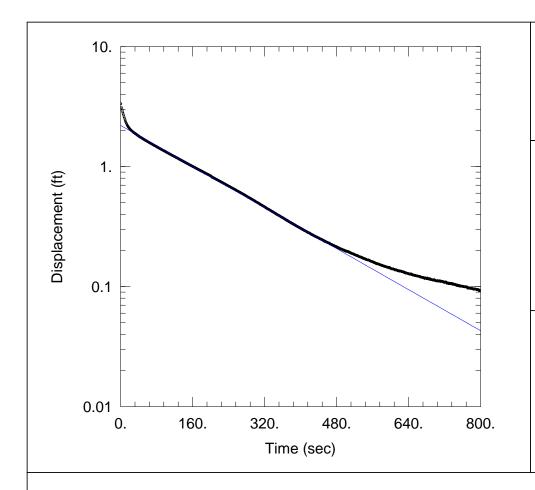
WELL DATA (E2-1)

Static Water Column Height: 24.7 ft

Screen Length: 24.07 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 24.07 ft



E2-1 SLUG OUT 2

Data Set: T:\...\E2-1_slugout_2.aqt

Date: 05/04/17 Time: 09:20:15

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-1

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.636 ft/day

y0 = 2.201 ft

AQUIFER DATA

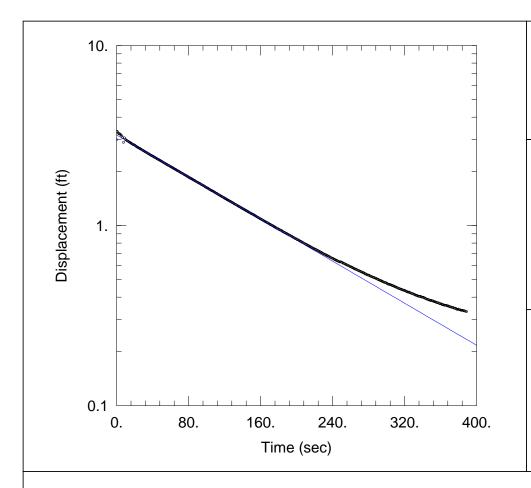
Saturated Thickness: 24.07 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (E2-1)

Initial Displacement: 3. ft Static Water Column Height: 24.7 ft

Screen Length: 24.07 ft Well Radius: 0.5 ft

Total Well Penetration Depth: 24.07 ft



E2-2 SLUG IN 1

Data Set: T:\...\E2-2_slugin_1.aqt

Date: 05/04/17 Time: 09:20:29

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-2 Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.869 ft/day

y0 = 3.19 ft

AQUIFER DATA

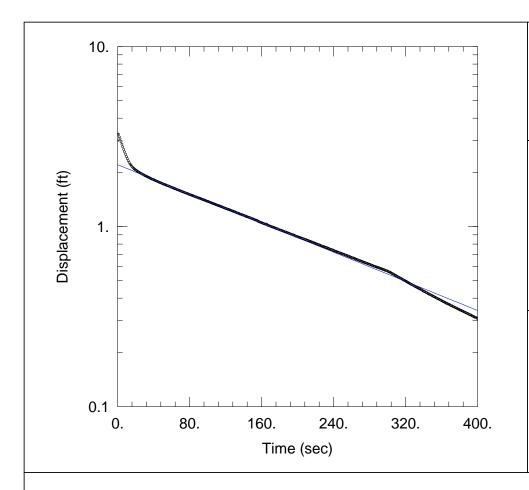
Saturated Thickness: 26.02 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (E2-2)

Initial Displacement: 3. ft Static Water Column Height: 25.1 ft

Screen Length: 25. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 26.02 ft



E2-2 SLUG OUT 1

Data Set: T:\...\E2-2_slugout_1.aqt

Date: 05/04/17 Time: 09:20:40

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-2

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.988 ft/dayy0 = 2.206 ft

AQUIFER DATA

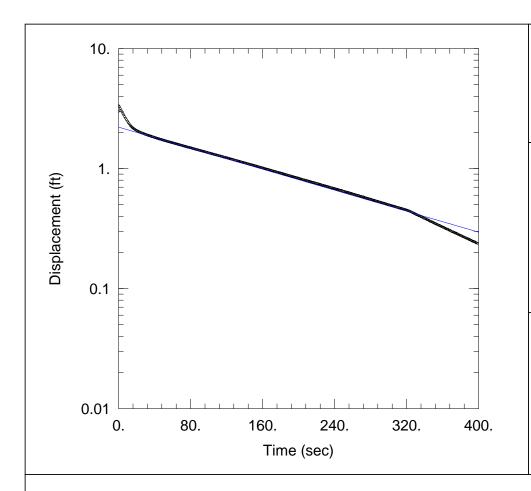
Saturated Thickness: 26.02 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (E2-2)

Initial Displacement: 3. ft Static Water Column Height: 25.1 ft

Screen Length: 25. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 26.02 ft



E2-2 SLUG OUT 2

Data Set: T:\...\E2-2_slugout_2.aqt

Date: 05/04/17 Time: 09:20:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-2

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.148 ft/day

y0 = 2.214 ft

AQUIFER DATA

Saturated Thickness: <u>26.02</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (E2-2)

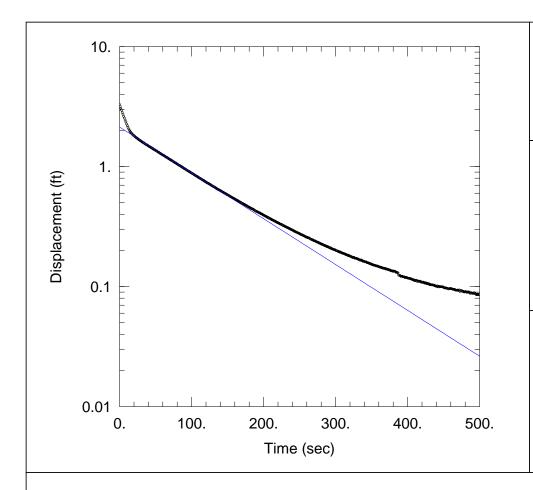
Initial Displacement: 3. ft

Total Well Penetration Depth: 26.02 ft

Casing Radius: 0.25 ft

Static Water Column Height: 25.1 ft

Screen Length: <u>25.</u> ft Well Radius: 0.5 ft



E2-3 SLUG OUT 1

Data Set: T:\...\E2-3_slugout_1.aqt

Date: 05/04/17 Time: 09:34:15

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: <u>E2-3</u> Test Date: <u>8/30/2016</u>

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.855 ft/dayy0 = 2.135 ft

AQUIFER DATA

Saturated Thickness: <u>24.7</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

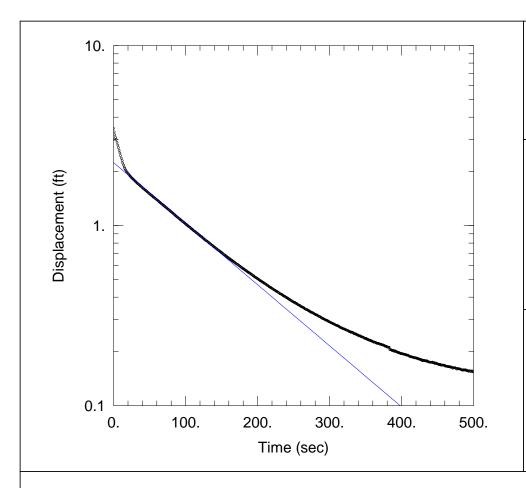
WELL DATA (E2-3)

Static Water Column Height: 21.8 ft

Screen Length: 24.6 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 24.6 ft



E2-3 SLUG OUT 2

Data Set: T:\...\E2-3_slugout_2.aqt

Date: 05/04/17 Time: 09:34:30

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: <u>E2-3</u> Test Date: <u>8/30/2016</u>

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.559 ft/dayy0 = 2.239 ft

AQUIFER DATA

Saturated Thickness: <u>24.7</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

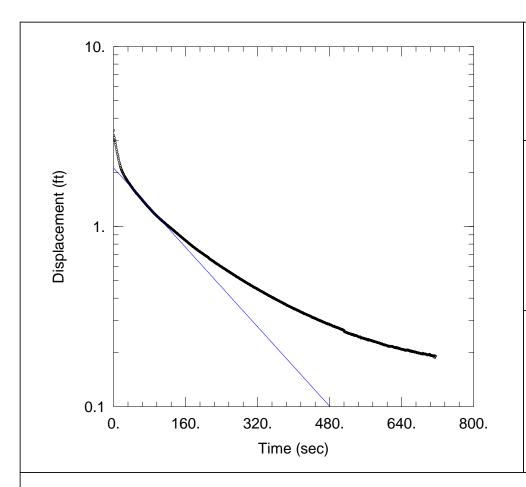
WELL DATA (E2-3)

Static Water Column Height: 21.8 ft

Screen Length: 24.68 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 24.68 ft



E2-4 SLUG OUT 1

Data Set: T:\...\E2-4_slugout_1.aqt

Date: 05/04/17 Time: 09:34:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-4

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{3.001}{2.118}$ ft/day

y0 = 2.118 ft

AQUIFER DATA

Saturated Thickness: 21.6 ft Anisotropy Ratio (Kz/Kr): 0.1

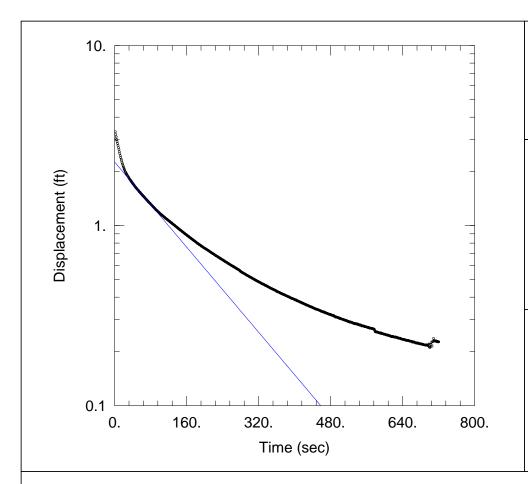
WELL DATA (E2-4)

Static Water Column Height: 21. ft

Screen Length: 21. ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 21. ft



E2-4 SLUG OUT 2

Data Set: T:\...\E2-4_slugout_2.aqt

Date: 05/04/17 Time: 09:34:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-4

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.446 ft/day

y0 = 2.257 ft

AQUIFER DATA

Saturated Thickness: 21.6 ft Anisotropy Ratio (Kz/Kr): 0.1

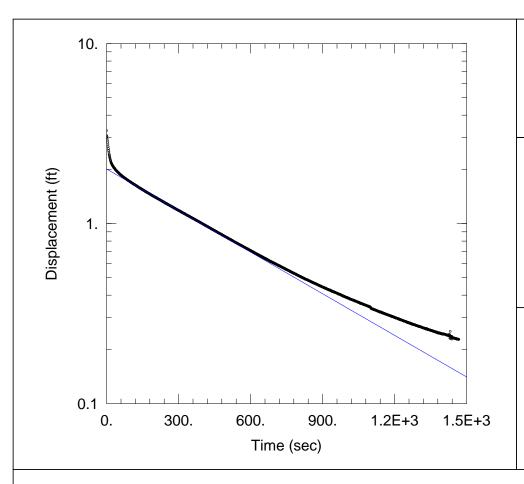
WELL DATA (E2-4)

Static Water Column Height: 21. ft

Screen Length: 21.6 ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 21.6 ft



E2-5 SLUG OUT 1

Data Set: T:\...\E2-5_slugout_1.aqt

Date: 05/04/17 Time: 09:35:03

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-5

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.7526 ft/day

y0 = 2.01 ft

AQUIFER DATA

Saturated Thickness: 25.3 ft Anisotropy Ratio (Kz/Kr): 0.1

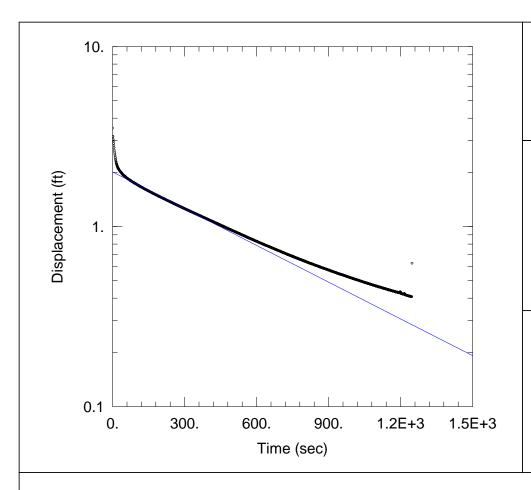
WELL DATA (E2-5)

Static Water Column Height: 27.5 ft

Screen Length: 25. ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 25.3 ft



E2-5 SLUG OUT 2

Data Set: T:\...\E2-5_slugout_2.aqt

Date: 05/04/17 Time: 09:35:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV

Test Well: E2-5

Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.6653 ft/day

y0 = 2.013 ft

AQUIFER DATA

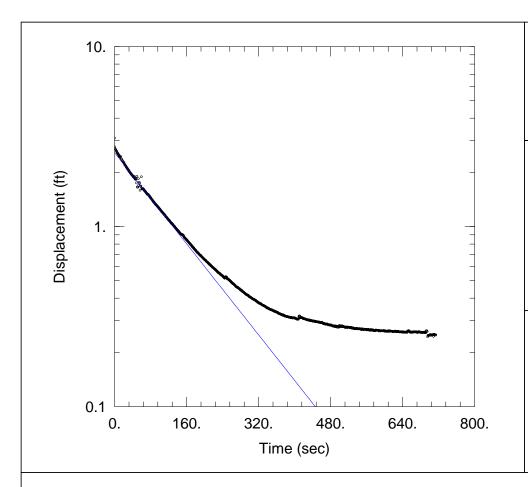
Saturated Thickness: <u>25.29</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (E2-5)

Initial Displacement: 3. ft Static Water Column Height: 27.5 ft

Screen Length: 25. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 25.3 ft



UFIW-01D SLUG IN 1

Data Set: T:\...\UFIW-01D_slugin_1.aqt

Date: 05/04/17 Time: 09:37:23

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.649}{2.574}$ ft/day y0 = $\frac{1.649}{2.574}$ ft

AQUIFER DATA

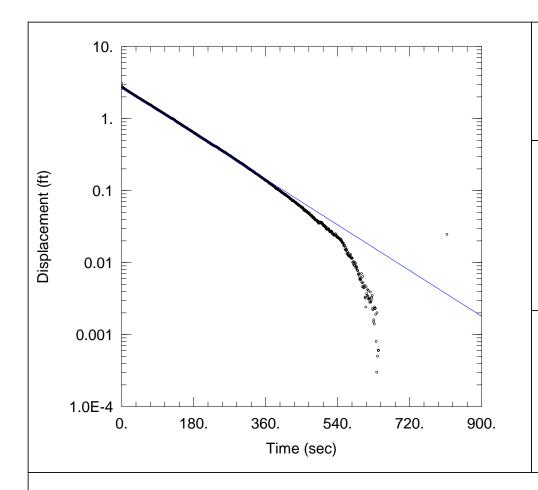
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01D)

Initial Displacement: 3.1 ft Static Water Column Height: 20.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>20.</u> ft Casing Radius: 0.083 ft



UFIW-01D SLUG IN 2

Data Set: T:\...\UFIW-01D_slugin_2.aqt

Date: 05/04/17 Time: 09:39:17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.839 ft/dayy0 = 2.688 ft

AQUIFER DATA

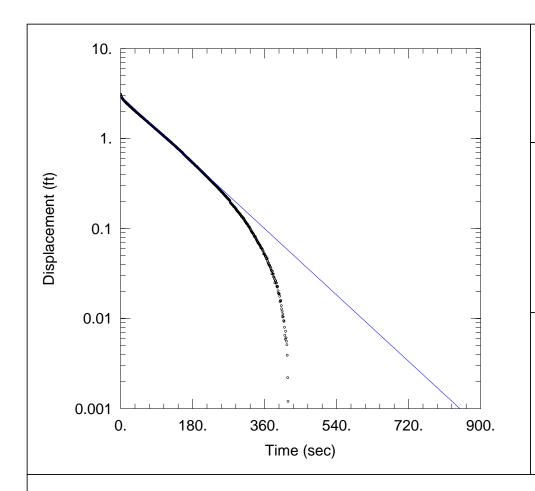
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01D)

Initial Displacement: 3.1 ft Static Water Column Height: 20.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-01D SLUG OUT 1

Data Set: T:\...\UFIW-01D_slugout_1.aqt

Date: 05/04/17 Time: 09:40:57

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.136 ft/dayy0 = 2.985 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

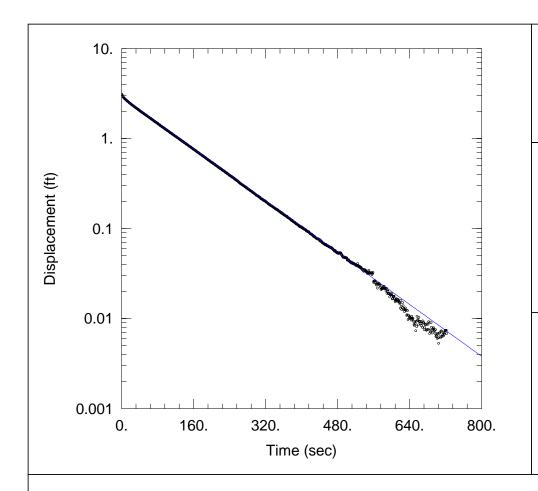
WELL DATA (UFIW-01D)

Static Water Column Height: 20.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 20. ft



UFIW-01D SLUG OUT 2

Data Set: T:\...\UFIW-01D_slugout_2.aqt

Date: 05/04/17 Time: 09:41:08

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01D Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.876 ft/dayy0 = 2.884 ft

AQUIFER DATA

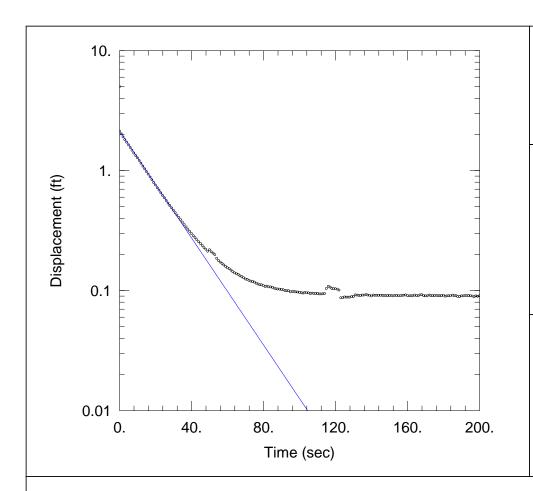
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01D)

Initial Displacement: 3.1 ft Static Water Column Height: 20.3 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-01I SLUG IN 1

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{10.37}{2.139}$ ft/day y0 = $\frac{2.139}{2.139}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01I)

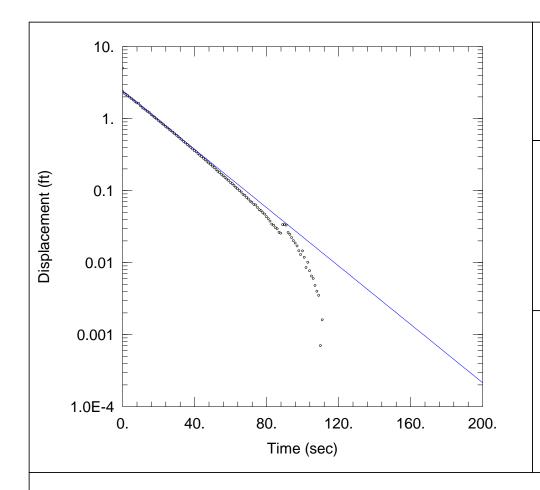
Initial Displacement: <u>5.</u> ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: <u>8.46</u> ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-01I SLUG IN 2

Data Set: T:\...\UFIW-01I_slugin_2_MBQC.aqt Time: 09:41:57

Date: 05/04/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 9.421 ft/dayy0 = 2.419 ft

AQUIFER DATA

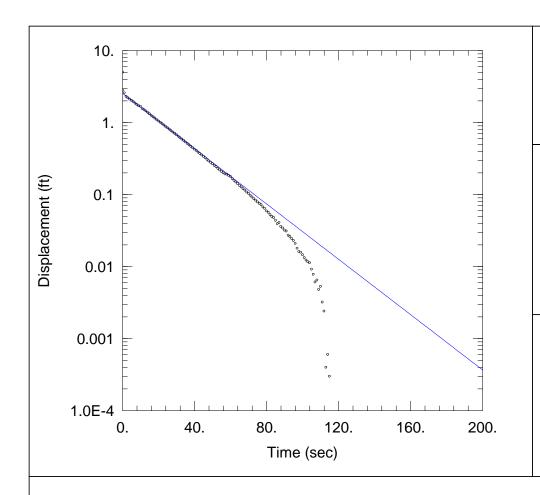
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01I)

Initial Displacement: 5. ft Static Water Column Height: 8.46 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



Casing Radius: 0.083 ft

UFIW-01I SLUG IN 3

Data Set: T:\...\UFIW-01I_slugin_3_MBQC.aqt
Date: 05/04/17 Time: 09:42:11

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 8.935 ft/day

y0 = 2.55 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01I)

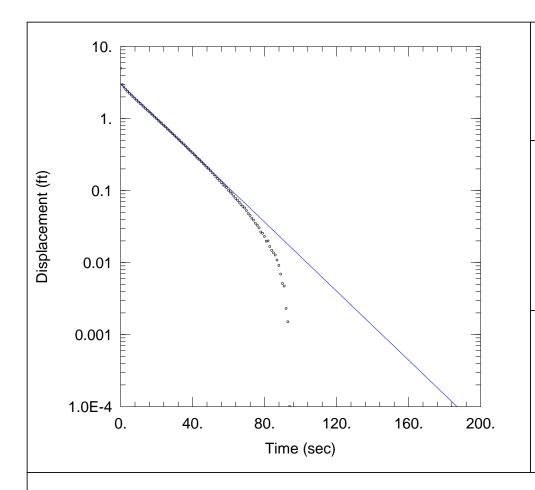
Initial Displacement: <u>5.</u> ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: <u>8.46</u> ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-01I SLUG OUT 1

Data Set: T:\...\UFIW-01I_slugout_1_MBQC.aqt Date: 05/04/17 Time: 09:42:20

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 11.15 ft/dayy0 = 3.024 ft

AQUIFER DATA

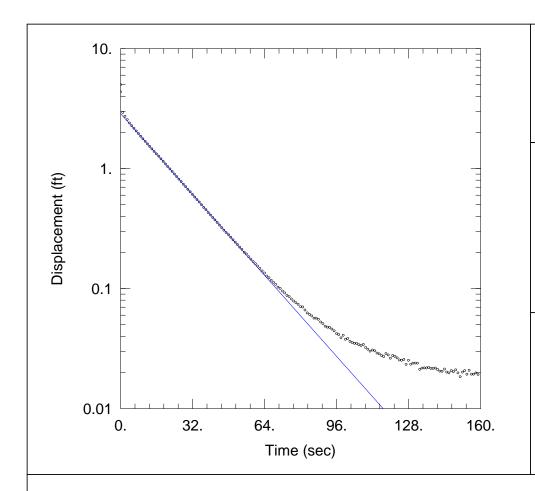
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-01I)

Initial Displacement: 5. ft Static Water Column Height: 8.46 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW-01I SLUG OUT 2

Data Set: T:\...\UFIW-01I_slugout_2_MBQC.aqt
Date: 05/04/17 Time: 09:42:30

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{9.795}{2.872}$ ft/day y0 = $\frac{9.795}{2.872}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

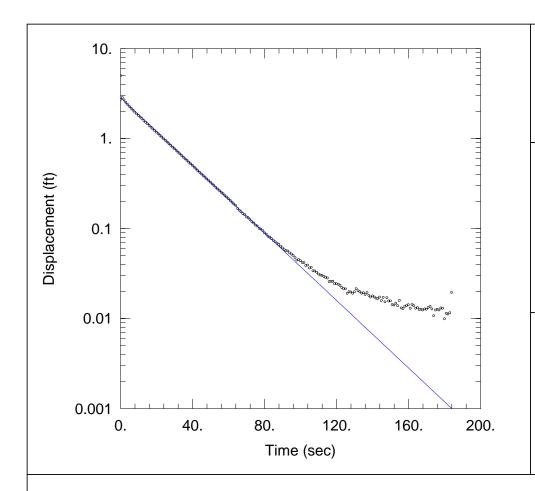
WELL DATA (UFIW-01I)

Static Water Column Height: 8.46 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 5. ft

Total Well Penetration Depth: 10. ft



UFIW-01I SLUG OUT 3

Data Set: T:\...\UFIW-01I_slugout_3_MBQC.aqt
Date: 05/04/17 Time: 09:42:44

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 8.726 ft/dayy0 = 2.837 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

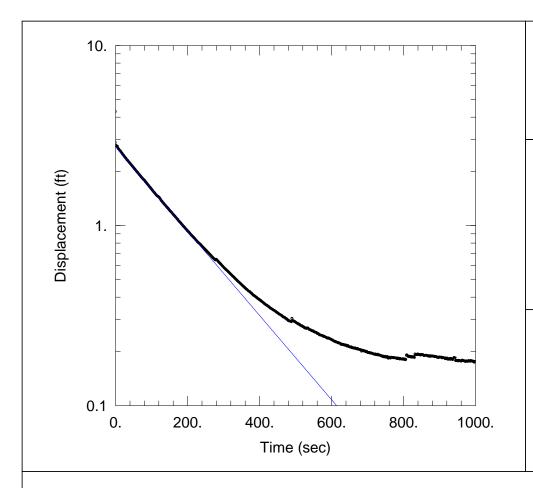
WELL DATA (UFIW-01I)

Static Water Column Height: 8.46 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 5. ft

Total Well Penetration Depth: 10. ft



UFIW-02D SLUG IN 1

Data Set: T:\...\UFIW-02D_slugin_1.aqt

Date: 05/04/17 Time: 09:42:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.221 ft/dayy0 = 2.739 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

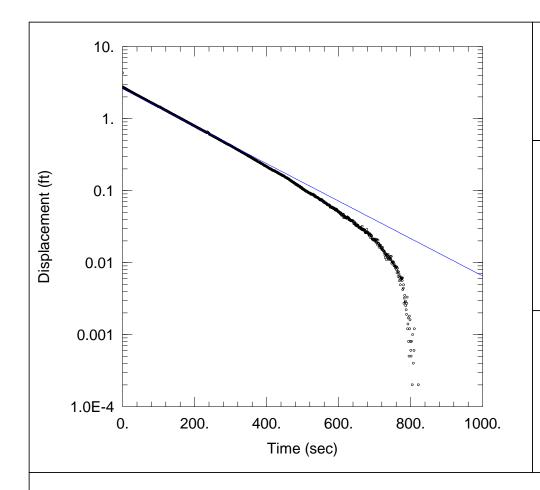
WELL DATA (UFIW-02D)

Static Water Column Height: 21.1 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Initial Displacement: 4.3 ft

Total Well Penetration Depth: 20. ft



UFIW-02D SLUG IN 2

Data Set: T:\...\UFIW-02D_slugin_2.aqt

Date: 05/04/17 Time: 09:43:03

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.356 ft/dayy0 = 2.599 ft

AQUIFER DATA

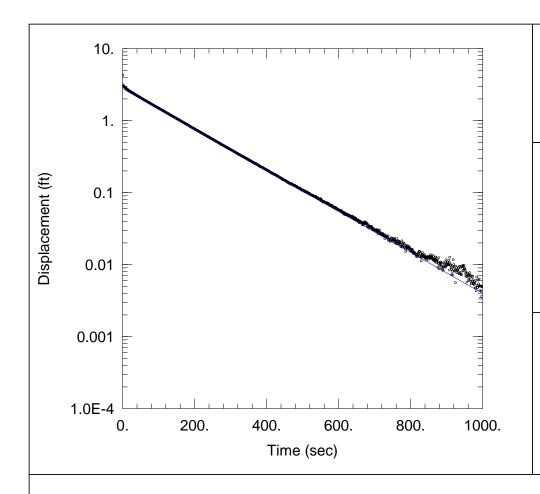
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-02D)

Initial Displacement: 4.3 ft Static Water Column Height: 21.1 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-02D SLUG OUT 1

Data Set: T:\...\UFIW-02D_slugout_1.aqt

Date: 05/04/17 Time: 09:43:14

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.482}{2.775}$ ft/day y0 = $\frac{1.482}{2.775}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

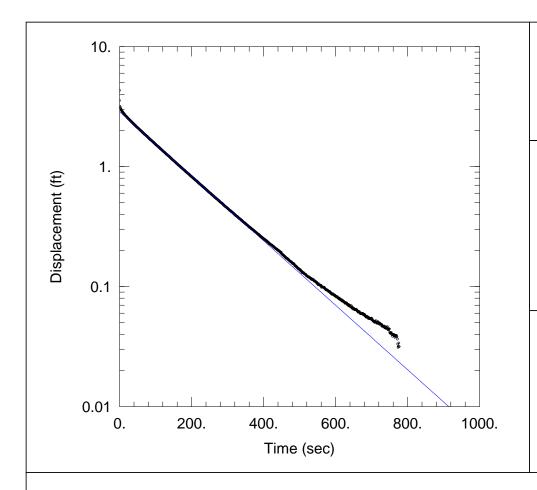
WELL DATA (UFIW-02D)

Initial Displacement: 4.3 ft Static Water Column Height: 21.1 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft

Casing Radius: 0.083 ft



UFIW-02D SLUG OUT 2

Data Set: T:\...\UFIW-02D_slugout_2.aqt

Date: 05/04/17 Time: 09:43:23

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-02D Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.401 ft/dayy0 = 2.866 ft

AQUIFER DATA

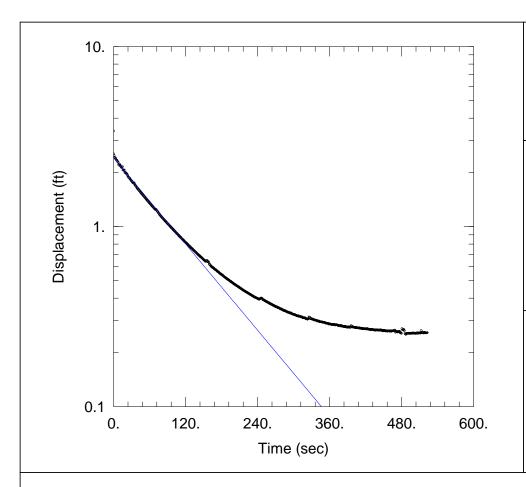
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-02D)

Initial Displacement: 4.3 ft Static Water Column Height: 21.1 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-02I SLUG IN 1

Data Set: T:\...\UFIW-02I_slugin_1.aqt

Date: 05/04/17 Time: 09:43:32

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.006}{2.409}$ ft/day y0 = $\frac{1.006}{2.409}$ ft

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

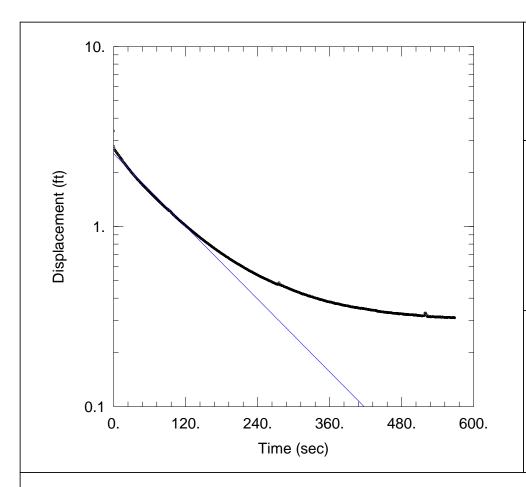
WELL DATA (UFIW-02I)

Static Water Column Height: 13.92 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.4 ft

Total Well Penetration Depth: 13. ft



UFIW-02I SLUG IN 2

Data Set: T:\...\UFIW-02I_slugin_2.aqt

Date: 05/04/17 Time: 09:43:45

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.8483 ft/day

 $y0 = \overline{2.541} \, ft$

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

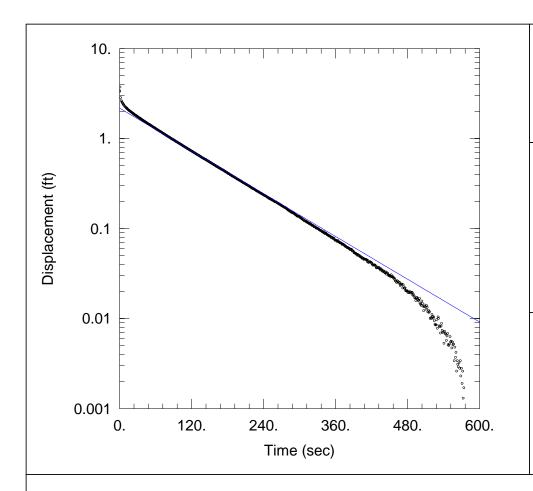
WELL DATA (UFIW-02I)

Static Water Column Height: 13.82 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.4 ft

Total Well Penetration Depth: 13. ft



UFIW-02I SLUG OUT 1

Data Set: T:\...\UFIW-02I_slugout_1.aqt

Date: 05/04/17 Time: 09:43:55

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9988 ft/day

y0 = 2.18 ft

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

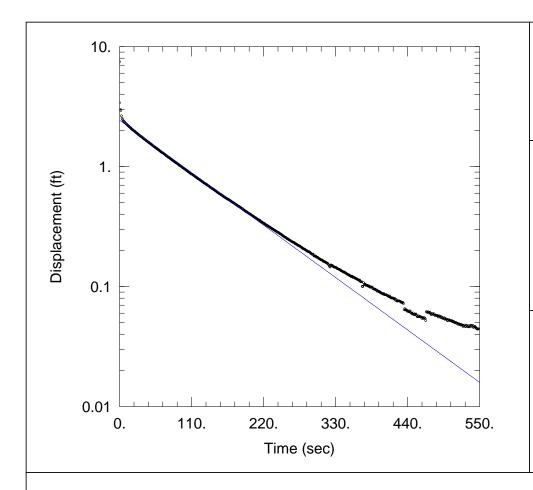
WELL DATA (UFIW-02I)

Static Water Column Height: 13.82 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.4 ft

Total Well Penetration Depth: 13. ft



UFIW-02I SLUG OUT 2

Data Set: T:\...\UFIW-02I_slugout_2.aqt

Date: <u>05/04/17</u> Time: <u>09:44:05</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.001}{2.432}$ ft/day y0 = $\frac{1.001}{2.432}$ ft

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

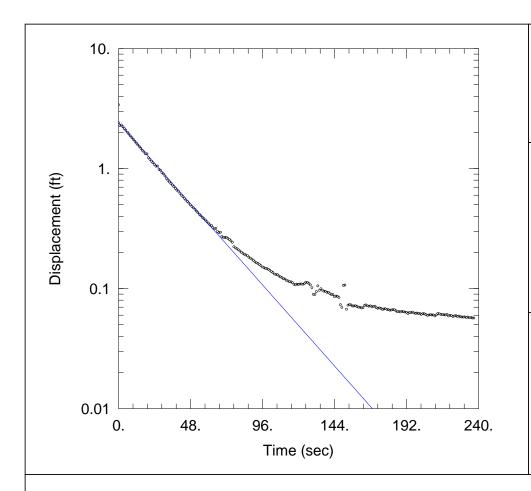
WELL DATA (UFIW-02I)

Static Water Column Height: 13.82 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.4 ft

Total Well Penetration Depth: 13. ft



UFIW-03D SLUG IN 1

Data Set: T:\...\UFIW-03D_slugin_1.aqt

Date: 05/04/17 Time: 09:44:16

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{7.343}{2.414}$ ft/day y0 = 2.414 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03D)

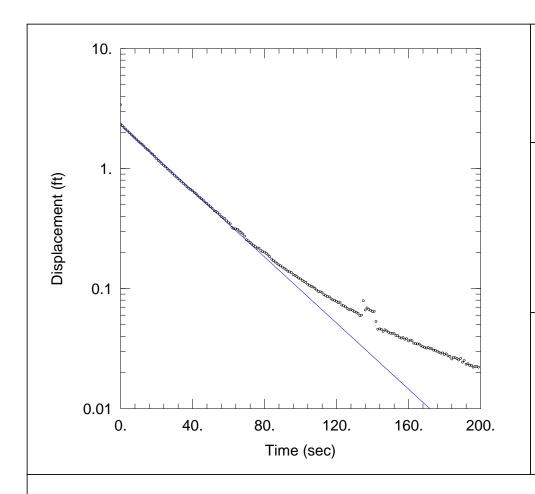
Initial Displacement: 3.4 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 22.9 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-03D SLUG IN 2

Data Set: T:\...\UFIW-03D_slugin_2.aqt

Date: 05/04/17 Time: 09:44:26

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{7.176}{2.314}$ ft/day y0 = 2.314 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03D)

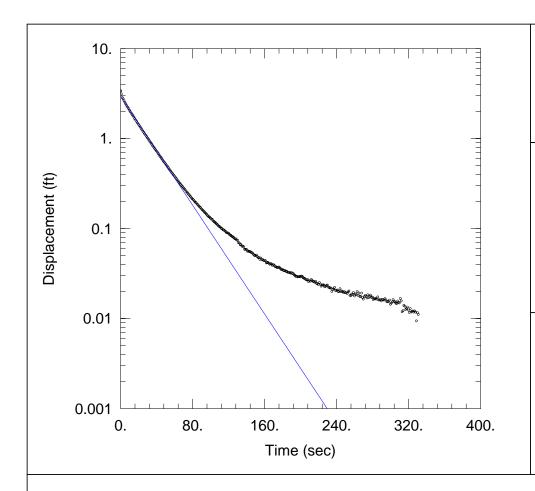
Initial Displacement: 3.4 ft

Total Well Penetration Depth: 20. ft

Casing Radius: 0.083 ft

Static Water Column Height: 22.9 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft



UFIW-03D SLUG OUT 1

Data Set: T:\...\UFIW-03D_slugout_1.aqt

Date: 05/04/17 Time: 09:44:34

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{7.875}{2.942}$ ft/day y0 = $\frac{7.875}{2.942}$ ft

AQUIFER DATA

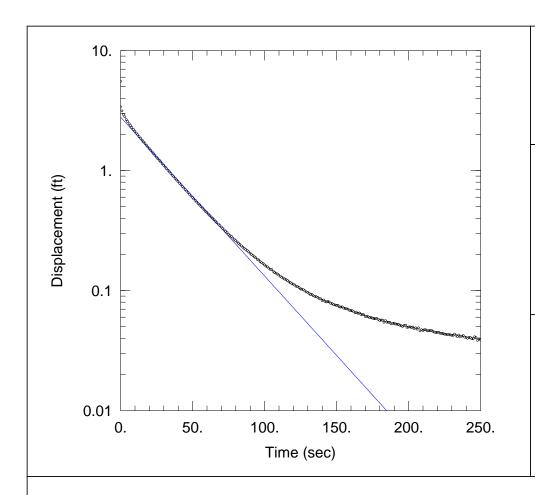
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03D)

Initial Displacement: 3.4 ft Static Water Column Height: 22.9 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-03D SLUG OUT 2

Data Set: T:\...\UFIW-03D_slugout_2.aqt

Date: 05/04/17 Time: 09:44:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 6.9 ft/dayy0 = 2.788 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03D)

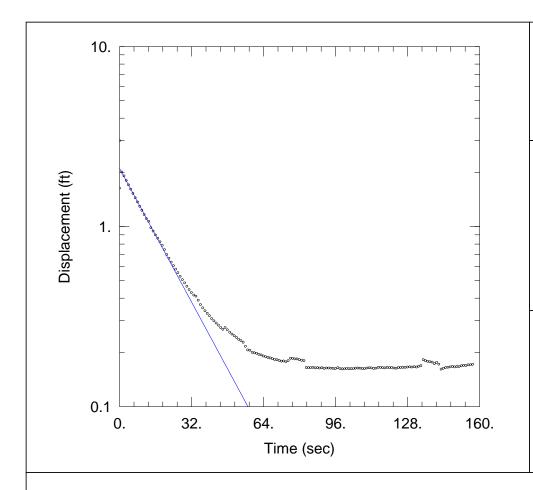
Initial Displacement: 3.4 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 22.9 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-03I SLUG IN 1

Data Set: T:\...\UFIW-03I_slugin_1.aqt

Date: 05/04/17 Time: 09:44:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{10.79}{2.105}$ ft/day y0 = $\frac{10.79}{2.105}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03I)

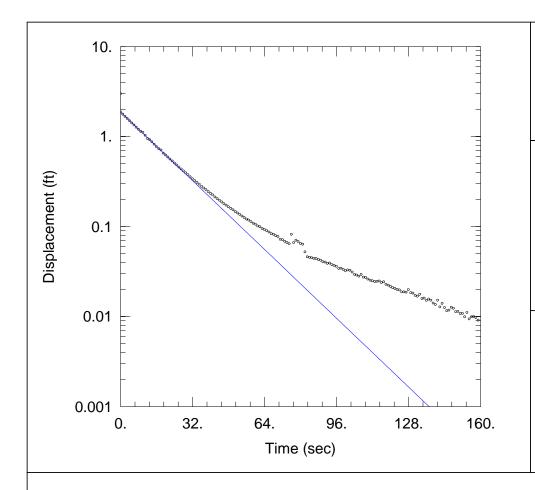
Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 13. ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-03I SLUG IN 2

Data Set: T:\...\UFIW-03I_slugin_2.aqt

Date: 05/04/17 Time: 09:45:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{11.1}{1.876}$ ft/day y0 = $\frac{1.876}{1.876}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

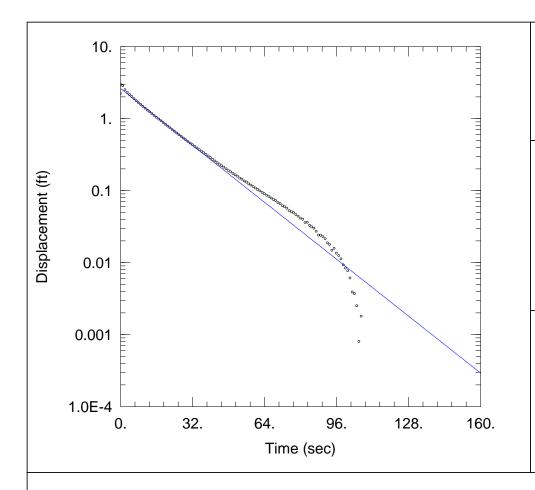
WELL DATA (UFIW-03I)

Static Water Column Height: 13. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFIW-03I SLUG OUT 1

Data Set: T:\...\UFIW-03I_slugout_1.aqt

Date: 05/04/17 Time: 09:55:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-03I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 11.48 ft/dayy0 = 2.617 ft

AQUIFER DATA

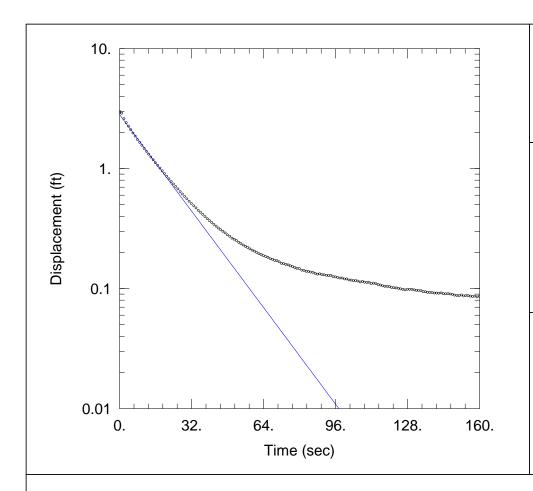
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03I)

Initial Displacement: 3. ft Static Water Column Height: 13. ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW-03I SLUG OUT 2

Data Set: T:\...\UFIW-03I_slugout_2.aqt

Date: 05/04/17 Time: 09:55:36

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-03I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{11.68}{2.816}$ ft/day y0 = 2.816 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-03I)

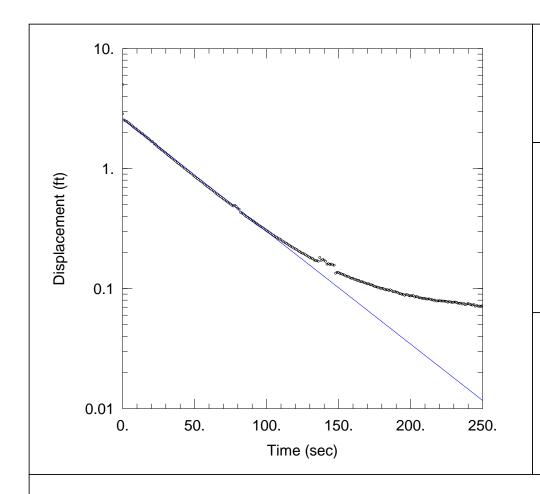
Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 13. ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-04D SLUG IN 1

Data Set: T:\...\UFIW-04D_slugin_1.aqt

Date: 05/04/17 Time: 09:55:44

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.895}{2.603}$ ft/day y0 = $\frac{4.895}{2.603}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04D)

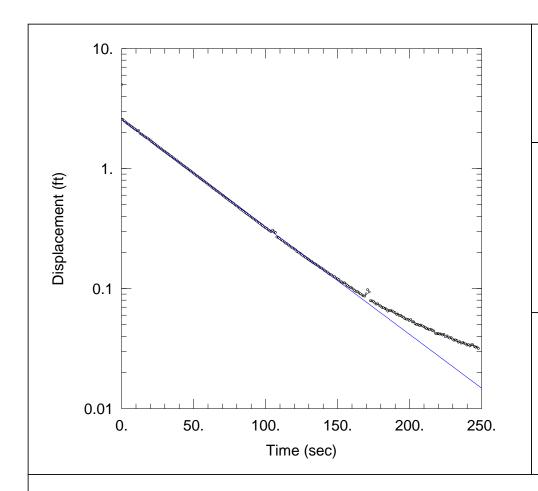
Initial Displacement: <u>5.</u> ft

Total Well Penetration Depth: 20. ft

Casing Radius: 0.083 ft

Static Water Column Height: 20.48 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft



UFIW-04D SLUG IN 2

Data Set: T:\...\UFIW-04D_slugin_2.aqt

Date: 05/04/17 Time: 09:55:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.669 ft/dayy0 = 2.566 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

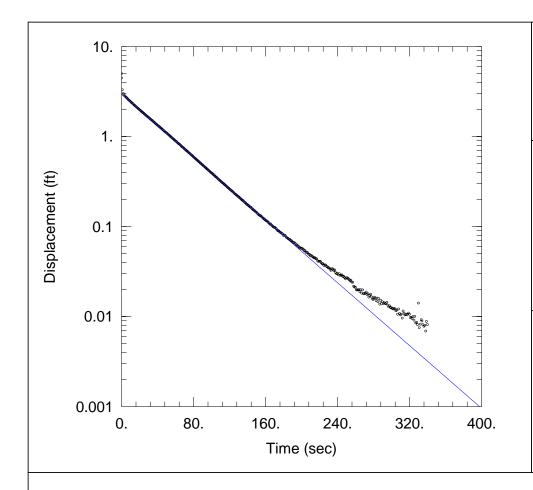
WELL DATA (UFIW-04D)

Initial Displacement: <u>5.</u> ft
Total Well Penetration Depth: 20. ft

Casing Radius: 0.083 ft

Static Water Column Height: 20.48 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-04D SLUG OUT 1

Data Set: T:\...\UFIW-04D_slugout_1.aqt

Time: 09:56:03 Date: 05/04/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-04D Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.546 ft/dayy0 = 2.939 ft

AQUIFER DATA

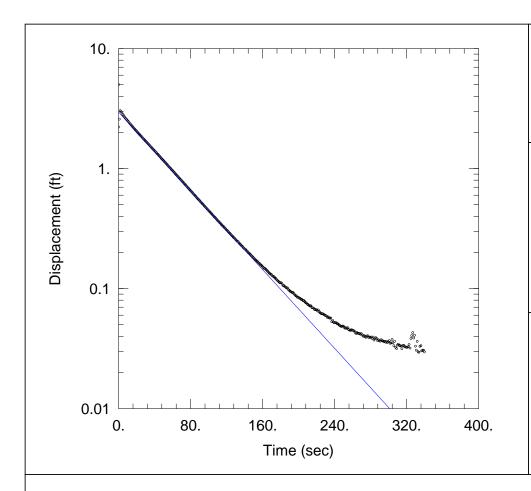
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04D)

Initial Displacement: 5. ft Static Water Column Height: 20.48 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-04D SLUG OUT 2

Data Set: T:\...\UFIW-04D_slugout_2.aqt

Date: 05/04/17 Time: 09:56:12

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.276}{2.956}$ ft/day y0 = $\frac{2.956}{2.956}$ ft

AQUIFER DATA

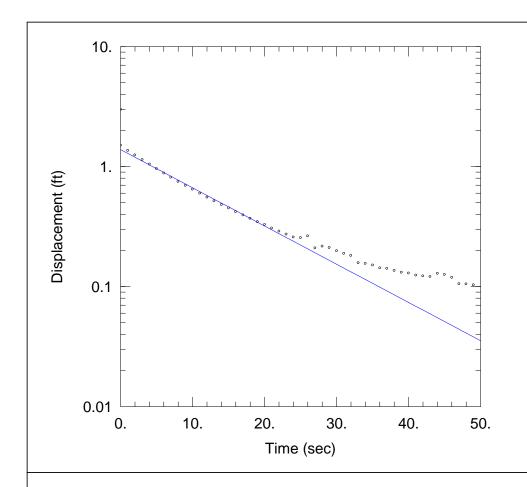
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04D)

Initial Displacement: <u>5.</u> ft Static Water Column Height: <u>20.48</u> ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft

Total Well Penetration Depth: 20. ft



UFIW-04I SLUG IN 1

Data Set: T:\...\UFIW-04I_slugin_1.aqt

Date: 05/04/17 Time: 09:56:39

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-04I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{14.81}{1.386}$ ft/day y0 = 1.386 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04I)

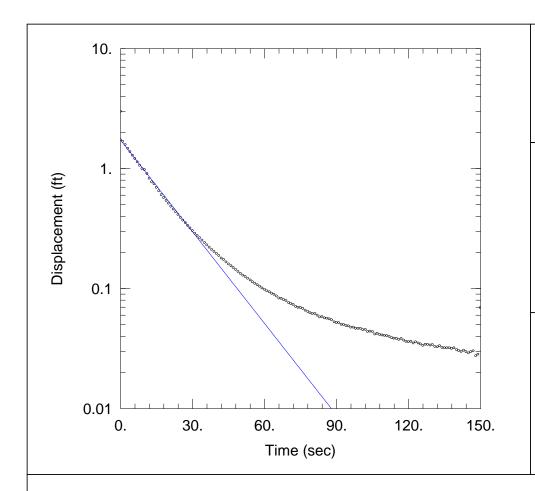
Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft

Casing Radius: 0.083 ft

Static Water Column Height: 10.77 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft



UFIW-04I SLUG IN 1

Data Set: T:\...\UFIW-04I_slugin_2.aqt

Date: 05/04/17 Time: 09:56:47

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-04I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 11.85 ft/day $y0 = \overline{1.727}$ ft

AQUIFER DATA

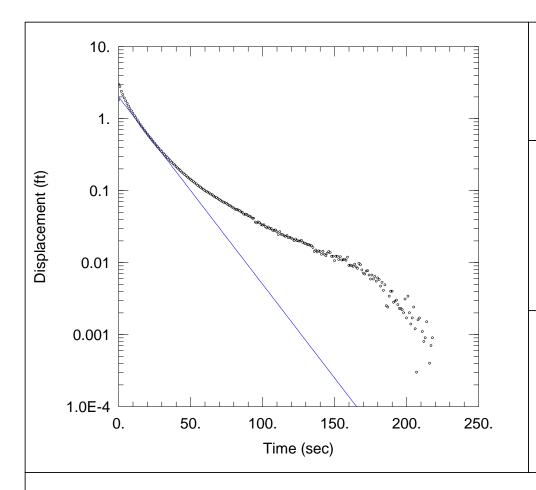
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04I)

Initial Displacement: 3. ft Static Water Column Height: 10.77 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW-04I SLUG OUT 1

Data Set: T:\...\UFIW-04I_slugout_1.aqt

Date: 05/04/17 Time: 09:56:56

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{12.11}{2.008}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

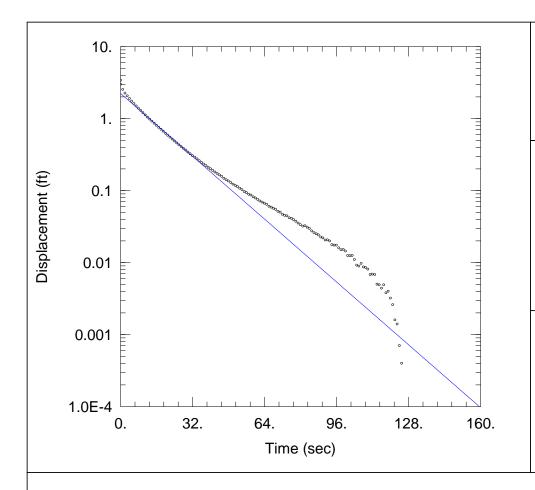
WELL DATA (UFIW-04I)

Static Water Column Height: 10.77 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFIW-04I SLUG OUT 2

Data Set: T:\...\UFIW-04I_slugout_2.aqt

Date: 05/04/17 Time: 09:57:05

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-04I Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 12.68 ft/dayy0 = 2.232 ft

AQUIFER DATA

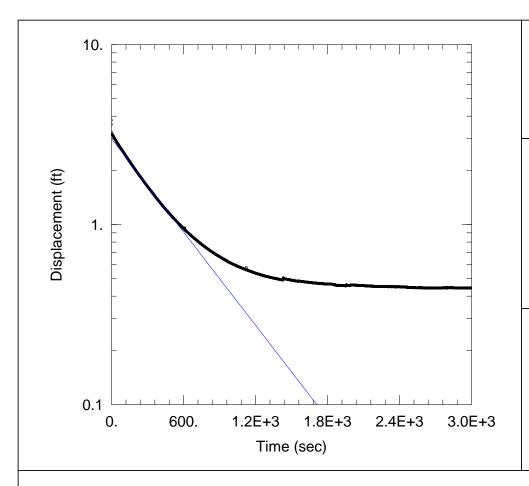
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04I)

Initial Displacement: 3. ft Static Water Column Height: 10.77 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW-05D SLUG IN 1

Data Set: T:\...\UFIW-05D_slugin_1.aqt

Date: <u>05/04/17</u> Time: <u>09:57:14</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4503 ft/day

 $y0 = \overline{3. ft}$

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

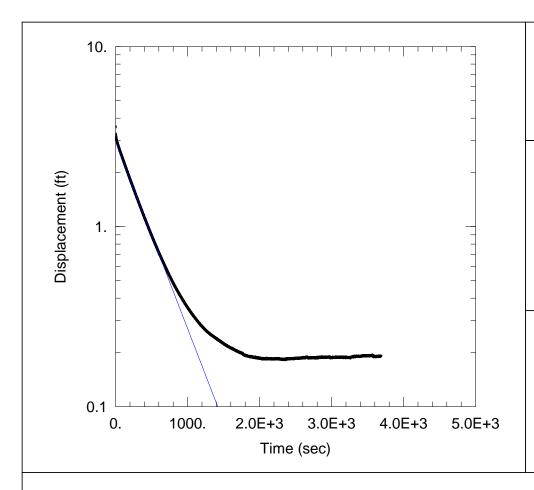
WELL DATA (UFIW-05D)

Static Water Column Height: 20.99 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.6 ft

Total Well Penetration Depth: 20. ft



UFIW-05D SLUG OUT 1

Data Set: T:\...\UFIW-05D_slugout_1.aqt

Date: 05/04/17 Time: 09:57:23

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \underline{0.5404} \text{ ft/day}$

y0 = 2.955 ft

AQUIFER DATA

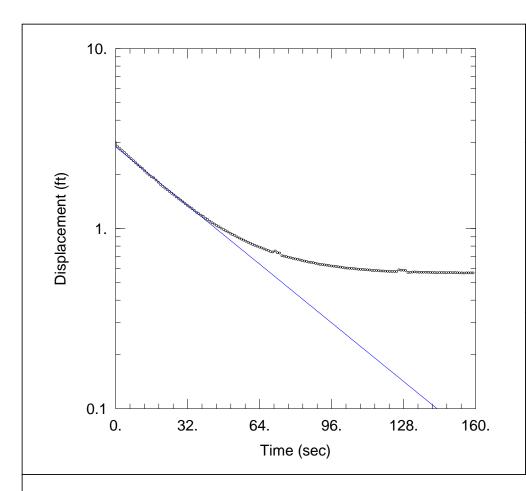
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-05D)

Initial Displacement: 3.6 ft Static Water Column Height: 20.99 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>20.</u> ft Casing Radius: 0.083 ft



UFIW-05I SLUG IN 1

Data Set: T:\...\UFIW-05I_slugin_1.aqt

Date: 05/04/17 Time: 09:57:32

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.735}{2.846}$ ft/day y0 = $\frac{4.735}{2.846}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

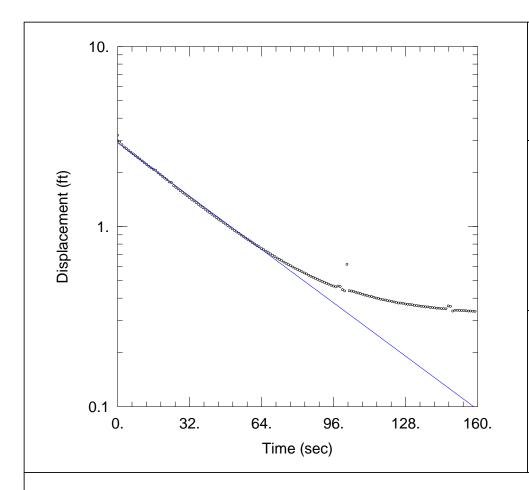
WELL DATA (UFIW-05I)

Static Water Column Height: 11.06 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFIW-05I SLUG IN 2

Data Set: T:\...\UFIW-05I_slugin_2.aqt

Date: 05/04/17 Time: 09:57:40

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-05I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.306}{2.921}$ ft/day y0 = 2.921 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-05I)

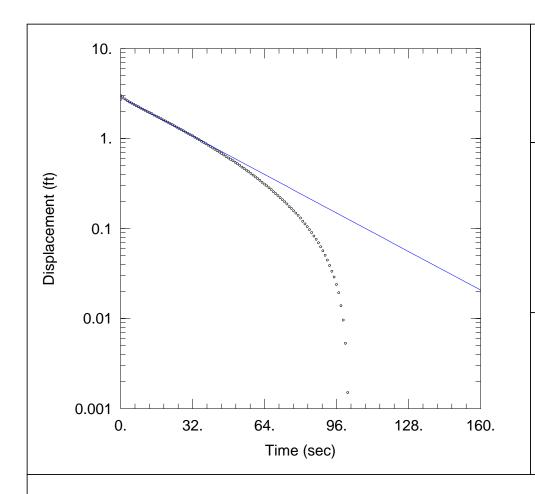
Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 11.06 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-05I SLUG OUT 1

Data Set: T:\...\UFIW-05I_slugout_1.aqt

Date: 05/04/17 Time: 09:57:48

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{6.22}{2.867}$ ft/day y0 = $\frac{6.22}{2.867}$ ft

AQUIFER DATA

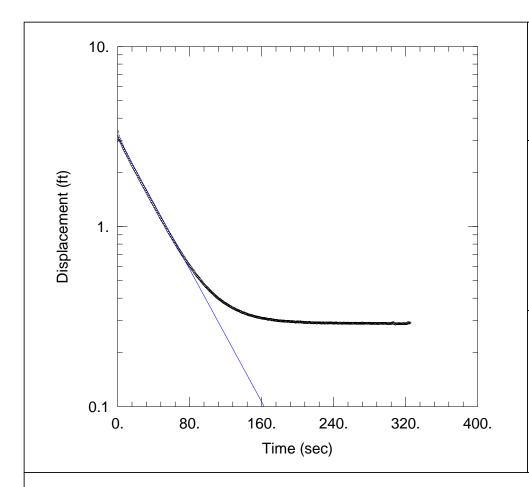
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-05I)

Initial Displacement: 3. ft Static Water Column Height: 11.06 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>10.</u> ft Casing Radius: 0.083 ft



UFIW-05I SLUG OUT 2

Data Set: T:\...\UFIW-05I_slugout_2.aqt

Date: 05/04/17 Time: 09:58:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.282}{3.165}$ ft/day y0 = $\frac{3.165}{3.165}$ ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

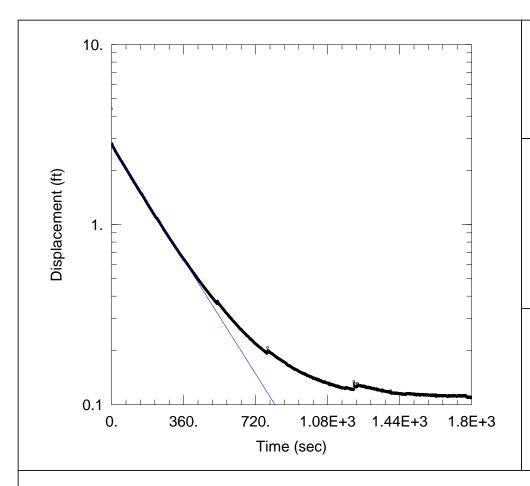
WELL DATA (UFIW-05I)

Static Water Column Height: 11.06 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFIW-06D SLUG IN 1

Data Set: T:\...\UFIW-06D_slugin_1.aqt

Date: <u>05/04/17</u> Time: <u>09:58:10</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9196 ft/day

y0 = 2.758 ft

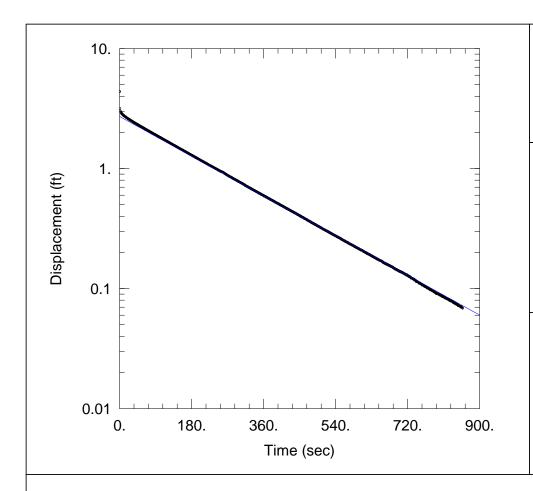
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-06D)

Initial Displacement: <u>4.4</u> ft Static Water Column Height: <u>22.85</u> ft Total Well Penetration Depth: 20. ft Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-06D SLUG OUT 1

Data Set: T:\...\UFIW-06D_slugout_1.aqt

Date: 05/04/17 Time: 09:58:19

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9579 ft/day

y0 = 2.716 ft

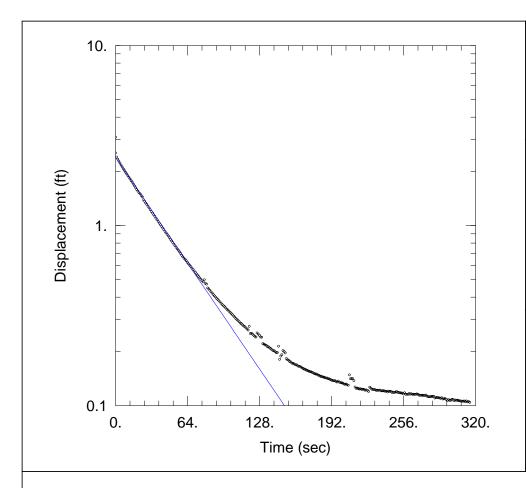
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-06D)

Initial Displacement: <u>4.4</u> ft Static Water Column Height: <u>22.85</u> ft Total Well Penetration Depth: 20. ft Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-06I SLUG IN 1

Data Set: T:\...\UFIW-06I_slugin_1.aqt

Date: 05/04/17 Time: 12:01:51

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.317 ft/dayy0 = 2.394 ft

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 0.1

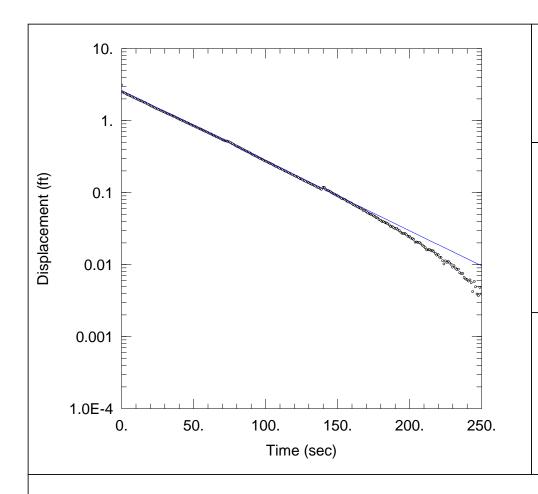
WELL DATA (UFIW-06I)

Static Water Column Height: 16.58 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 13. ft



UFIW-06I SLUG IN 2

Data Set: T:\...\UFIW-06I_slugin_2.aqt

Date: 05/04/17 Time: 12:02:07

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.455 ft/dayy0 = 2.617 ft

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 0.1

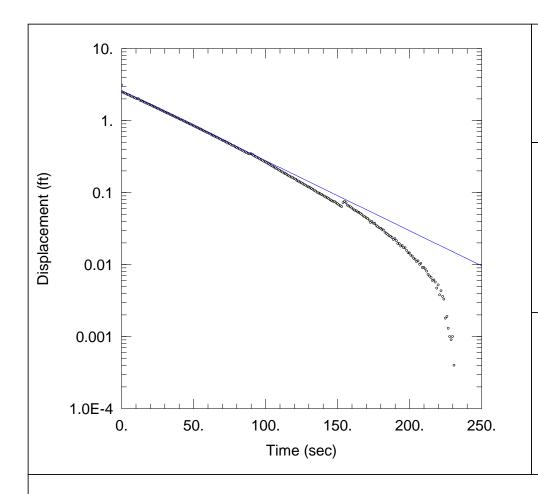
WELL DATA (UFIW-06I)

Static Water Column Height: 16.58 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 13. ft



UFIW-06I SLUG IN 3

Data Set: T:\...\UFIW-06I_slugin_3.aqt

Date: 05/04/17 Time: 12:02:19

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.455 ft/dayy0 = 2.617 ft

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

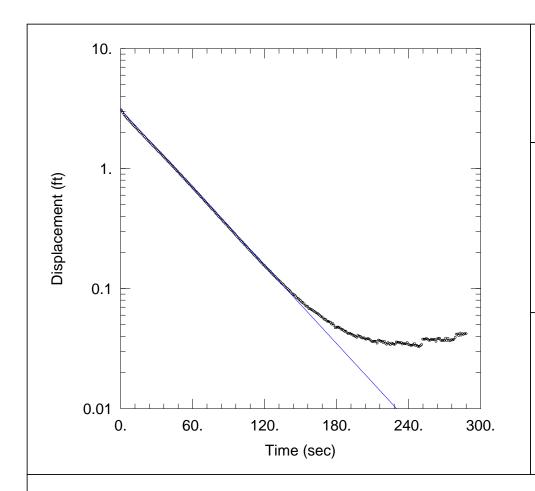
WELL DATA (UFIW-06I)

Static Water Column Height: 16.58 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 13. ft



UFIW-06I SLUG OUT 1

Data Set: T:\...\UFIW-06I_slugout_1.aqt

Date: 05/04/17 Time: 12:02:29

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.733 ft/dayy0 = 3.113 ft

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 0.1

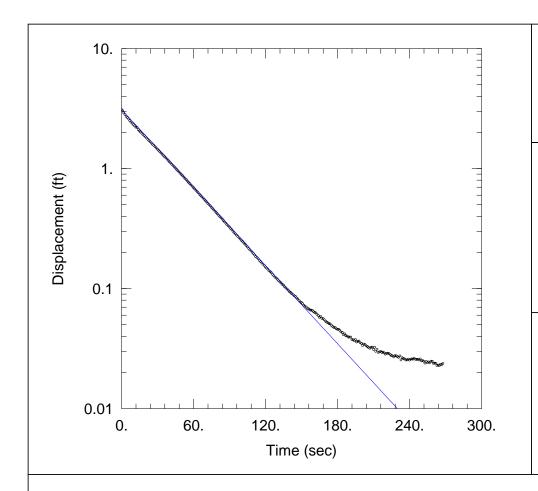
WELL DATA (UFIW-06I)

Static Water Column Height: 16.58 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 13. ft



UFIW-06I SLUG OUT 2

Data Set: T:\...\UFIW-06I_slugout_2.aqt

Date: 05/04/17 Time: 12:02:41

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 8/30/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.734 ft/dayy0 = 3.105 ft

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 0.1

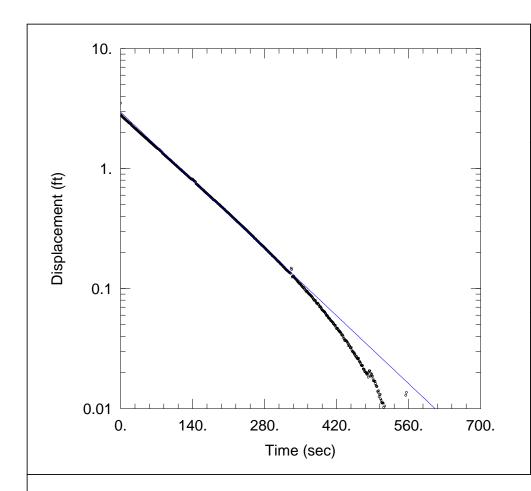
WELL DATA (UFIW-06I)

Static Water Column Height: 16.58 ft

Screen Length: 10. ft Well Radius: 0.33 ft

Initial Displacement: 3.1 ft

Total Well Penetration Depth: 13. ft



UFIW-07D SLUG IN 1

Data Set: T:\...\UFIW-07D_slugin_1.aqt

Date: 05/04/17 Time: 09:58:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.107}{2.959}$ ft/day y0 = $\frac{2.959}{2.959}$ ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

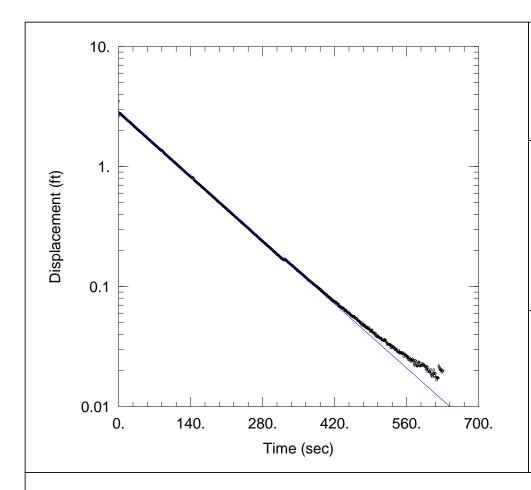
WELL DATA (UFIW-07D)

Static Water Column Height: 22.82 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.5 ft

Total Well Penetration Depth: 20. ft



UFIW-07D SLUG IN 2

Data Set: T:\...\UFIW-07D_slugin_2.aqt

Date: 05/04/17 Time: 09:58:45

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.989 ft/dayy0 = 2.873 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

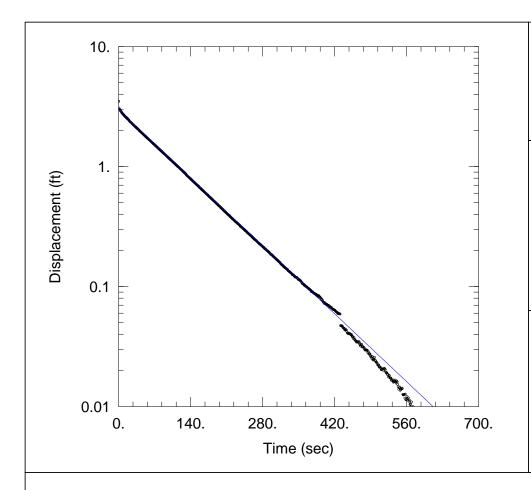
WELL DATA (UFIW-07D)

Static Water Column Height: 22.82 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.5 ft

Total Well Penetration Depth: 20. ft



Initial Displacement: 3.5 ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 20. ft

UFIW-07D SLUG OUT 1

Data Set: T:\...\UFIW-07D_slugout_1.aqt

Date: 05/04/17 Time: 09:58:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.107}{2.959}$ ft/day y0 = $\frac{2.959}{2.959}$ ft

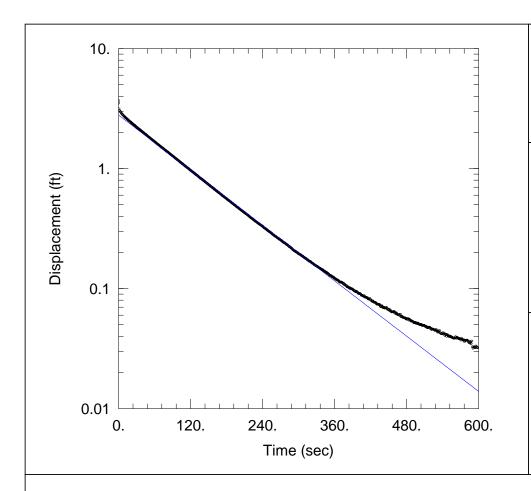
AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFIW-07D)

Static Water Column Height: 22.82 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-07D SLUG OUT 2

Data Set: T:\...\UFIW-07D_slugout_2.aqt

Date: 05/04/17 Time: 09:59:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.001}{2.791}$ ft/day y0 = $\frac{2.791}{1}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-07D)

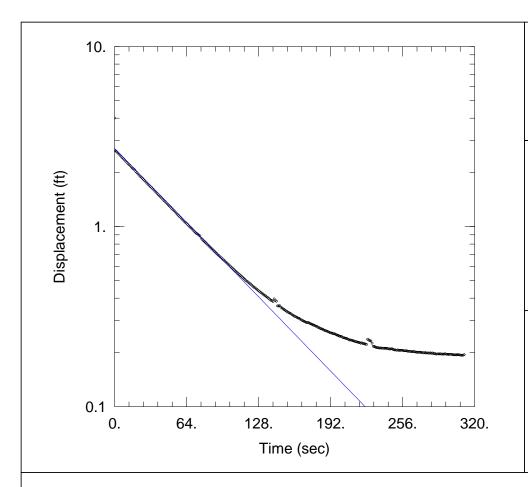
Initial Displacement: 3.5 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 22.82 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-07I SLUG IN 1

Data Set: T:\...\UFIW-07I_slugin_1.aqt

Date: 05/04/17 Time: 09:59:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.995 ft/dayy0 = 2.719 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-07I)

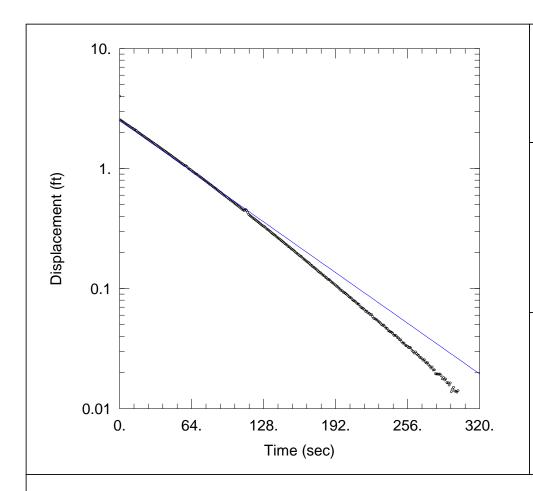
Initial Displacement: <u>4.</u> ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: <u>13.09</u> ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



Initial Displacement: 4. ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 10. ft

UFIW-07I SLUG IN 2

Data Set: T:\...\UFIW-07I_slugin_2.aqt

Date: 05/04/17 Time: 09:59:18

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-07I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.068 ft/dayy0 = 2.515 ft

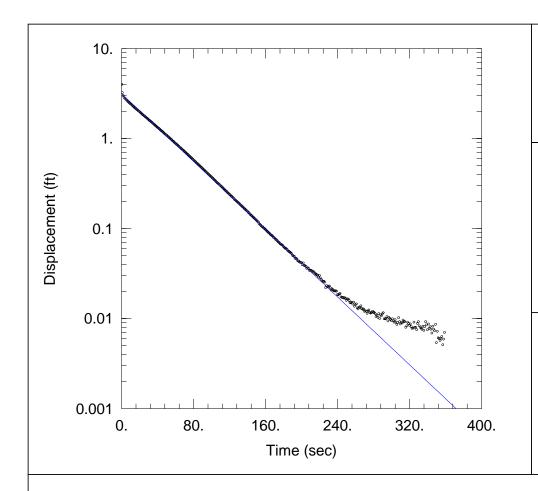
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-07I)

Static Water Column Height: 13.09 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-07I SLUG OUT 1

Data Set: T:\...\UFIW-07I_slugout_1.aqt

Date: 05/04/17 Time: 09:59:27

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.378}{3.154}$ ft/day y0 = $\frac{3.154}{3.154}$ ft

AQUIFER DATA

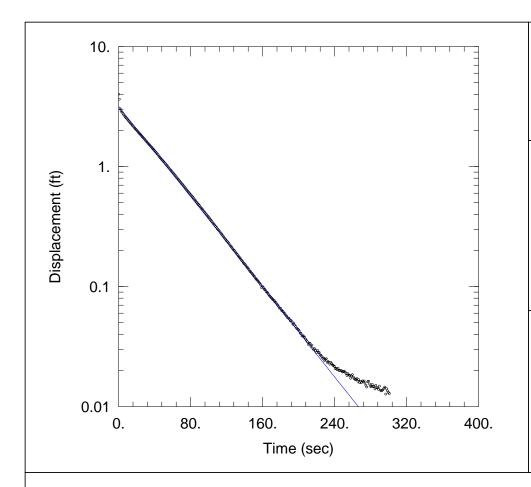
Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFIW-07I)

Initial Displacement: 4. ft Static Water Column Height: 13.09 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft

Total Well Penetration Depth: <u>10.</u> ft Casing Radius: 0.083 ft



UFIW-07I SLUG OUT 2

Data Set: T:\...\UFIW-07I_slugout_2.aqt

Date: 05/04/17 Time: 09:59:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-07I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.368}{3.175}$ ft/day y0 = $\frac{3.175}{3.175}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-07I)

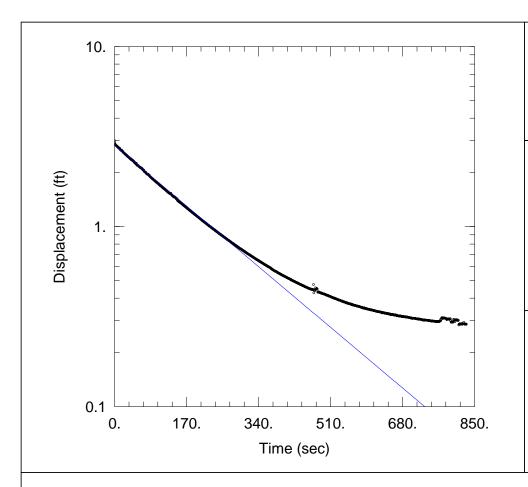
Initial Displacement: <u>4.</u> ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: <u>13.09</u> ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



Initial Displacement: 3. ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 20. ft

UFIW-08D SLUG IN 1

Data Set: T:\...\UFIW-08D_slugin_1.aqt

Date: 05/04/17 Time: 09:59:45

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08D
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.033}{2.826}$ ft/day y0 = $\frac{1.033}{2.826}$ ft

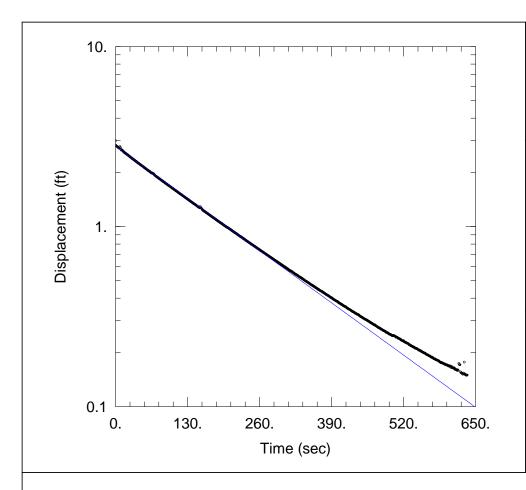
AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFIW-08D)

Static Water Column Height: 21.73 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-08D SLUG IN 2

Data Set: T:\...\UFIW-08D_slugin_2.aqt

Date: 05/04/17 Time: 09:59:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08D
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.163}{2.795}$ ft/day y0 = $\frac{1.163}{2.795}$ ft

AQUIFER DATA

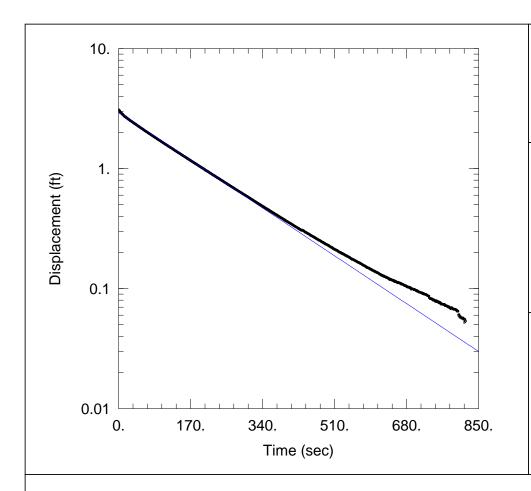
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08D)

Initial Displacement: 3. ft Static Water Column Height: 21.73 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft Casing Radius: 0.083 ft



UFIW-08D SLUG OUT 1

Data Set: T:\...\UFIW-08D_slugout_1.aqt

Date: 05/04/17 Time: 10:00:01

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08D
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.222}{2.943}$ ft/day y0 = 2.943 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08D)

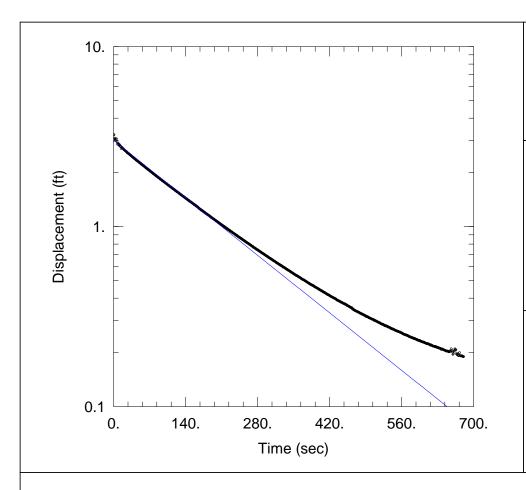
Initial Displacement: 3. ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 21.73 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-08D SLUG OUT 2

Data Set: T:\...\UFIW-08D_slugout_2.aqt

Date: 05/04/17 Time: 10:00:12

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-08D Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.19 ft/dayy0 = 3.016 ft

AQUIFER DATA

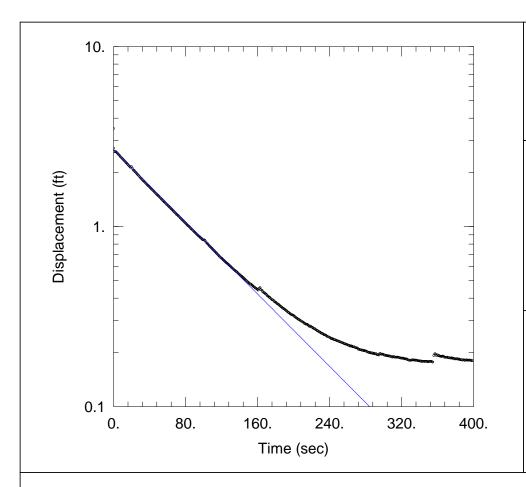
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08D)

Initial Displacement: 3. ft Static Water Column Height: 21.73 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 20. ft



UFIW-08I SLUG IN 1

Data Set: T:\...\UFIW-08I_slugin_1.aqt

Date: 05/04/17 Time: 10:00:19

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-08I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.337 ft/dayy0 = 2.686 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

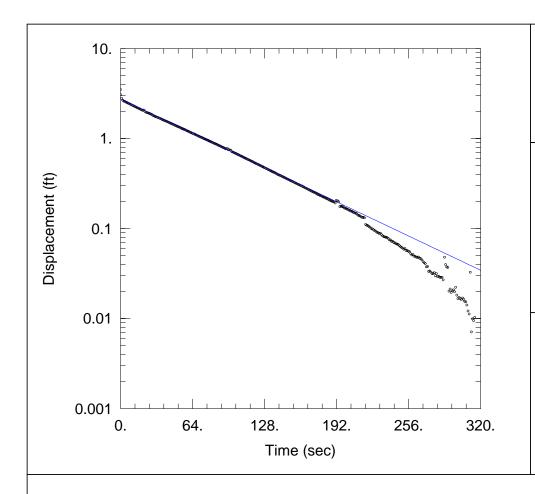
WELL DATA (UFIW-08I)

Static Water Column Height: 11.7 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Initial Displacement: 3.5 ft

Total Well Penetration Depth: 10. ft



UFIW-08I SLUG IN 2

Data Set: T:\...\UFIW-08I_slugin_2.aqt

Date: 05/04/17 Time: 10:00:28

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.765 ft/dayy0 = 2.756 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08I)

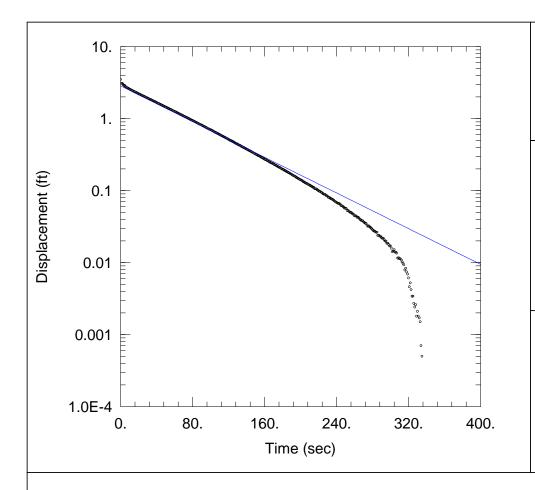
Initial Displacement: 3.5 ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 11.7 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-08I SLUG OUT 1

Data Set: T:\...\UFIW-08I_slugout_1.aqt

Date: 05/04/17 Time: 10:00:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-08I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.883 ft/dayy0 = 2.849 ft

AQUIFER DATA

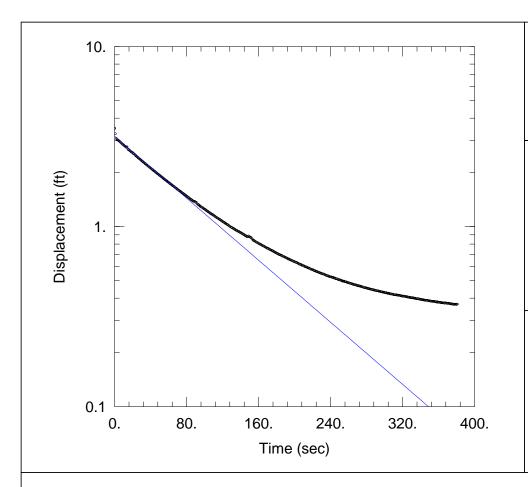
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08I)

Initial Displacement: 3.5 ft Static Water Column Height: 11.7 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFMW-01D SLUG IN 1

Data Set: T:\...\UFMW-01D_slugin_1.aqt

Date: 05/04/17 Time: 10:00:46

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-01D Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.028 ft/day

y0 = 3.182 ft

AQUIFER DATA

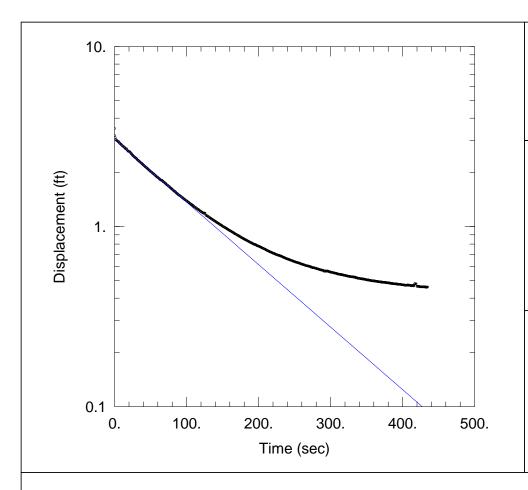
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01D)

Initial Displacement: 3.5 ft Static Water Column Height: 20.92 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 20. ft



UFMW-01D SLUG IN 2

Data Set: T:\...\UFMW-01D_slugin_2.aqt

Date: 05/04/17 Time: 10:00:55

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.634}{3.041}$ ft/day y0 = $\frac{3.041}{1}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

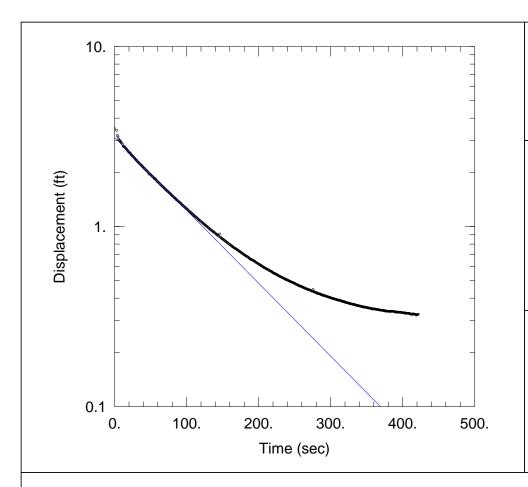
WELL DATA (UFMW-01D)

Static Water Column Height: 20.92 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 3.5 ft

Total Well Penetration Depth: 20. ft



UFMW-01D SLUG OUT 1

Data Set: T:\...\UFMW-01D_slugout_1.aqt

Date: 05/04/17 Time: 10:01:04

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.906}{3.132}$ ft/day y0 = $\frac{3.132}{3.132}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01D)

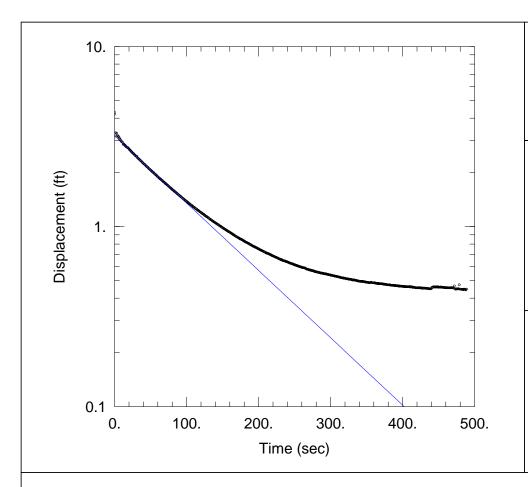
Initial Displacement: 3.5 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 20.92 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



Casing Radius: 0.083 ft

UFMW-01D SLUG OUT 2

Data Set: T:\...\UFMW-01D_slugout_2.aqt

Date: 05/04/17 Time: 10:01:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.761}{3.196}$ ft/day y0 = 3.196 ft

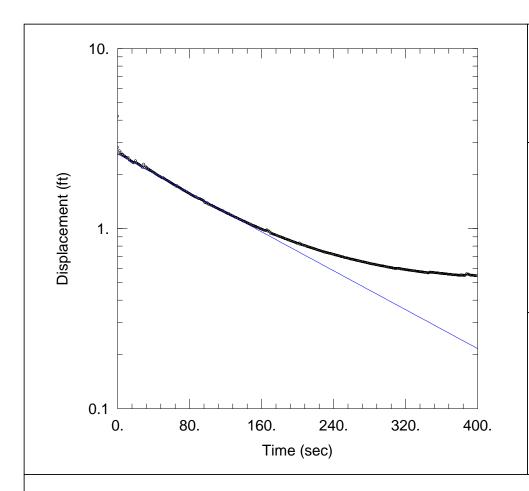
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01D)

Initial Displacement: <u>4.2 ft</u>
Total Well Penetration Depth: 20. ft
Static Water Column Height: <u>20.92 ft</u>
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-01I SLUG IN 1

Data Set: T:\...\UFMW-01I_slugin_1.aqt

Date: 05/04/17 Time: 10:01:21

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.126 ft/dayy0 = 2.597 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

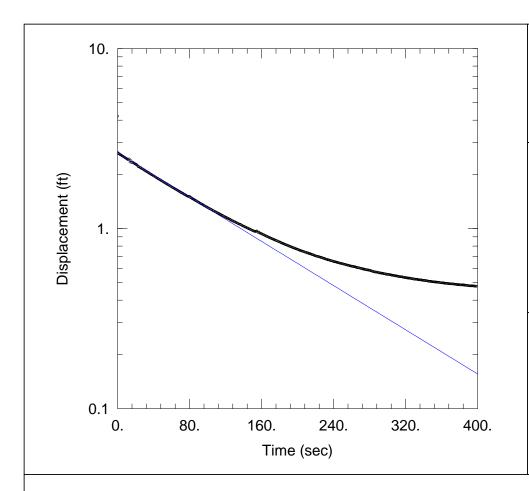
WELL DATA (UFMW-01I)

Static Water Column Height: 11.43 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 4.2 ft

Total Well Penetration Depth: 10. ft



UFMW-01I SLUG IN 2

Data Set: T:\...\UFMW-01I_slugin_2.aqt

Date: 05/04/17 Time: 10:01:29

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-01I Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.278 ft/dayy0 = 2.632 ft

AQUIFER DATA

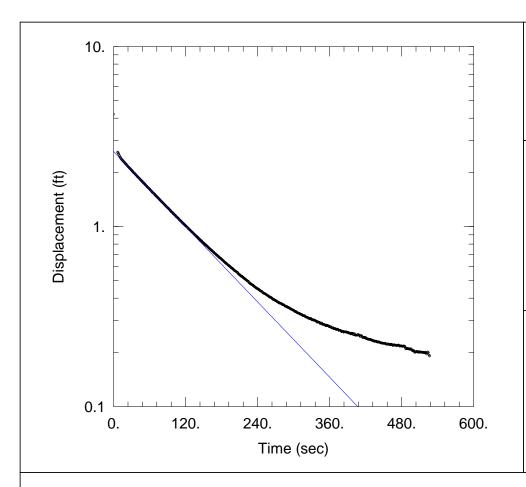
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01I)

Initial Displacement: 4.2 ft Static Water Column Height: 11.43 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 10. ft



Initial Displacement: 4.2 ft

Casing Radius: 0.083 ft

UFMW-01I SLUG OUT 1

Data Set: T:\...\UFMW-01I_slugout_1.aqt

Date: 05/04/17 Time: 10:01:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-01I Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.451 ft/dayy0 = 2.617 ft

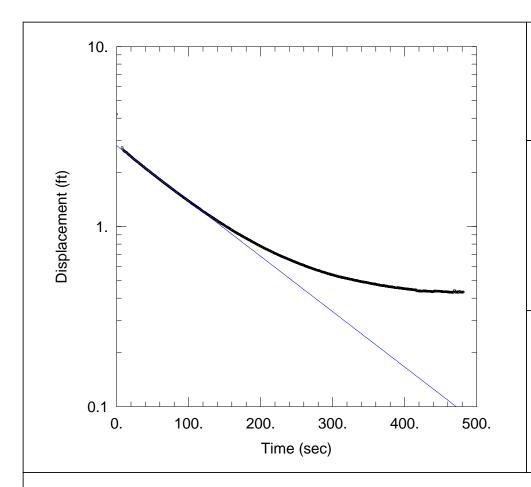
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01I)

Static Water Column Height: 11.43 ft Total Well Penetration Depth: 10. ft

Screen Length: 5. ft Well Radius: 0.5 ft



Casing Radius: 0.083 ft

UFMW-01I SLUG OUT 2

Data Set: T:\...\UFMW-01I_slugout_2.aqt

Date: 05/04/17 Time: 10:01:46

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.28}{2.819}$ ft/day y0 = $\frac{1.28}{2.819}$ ft

AQUIFER DATA

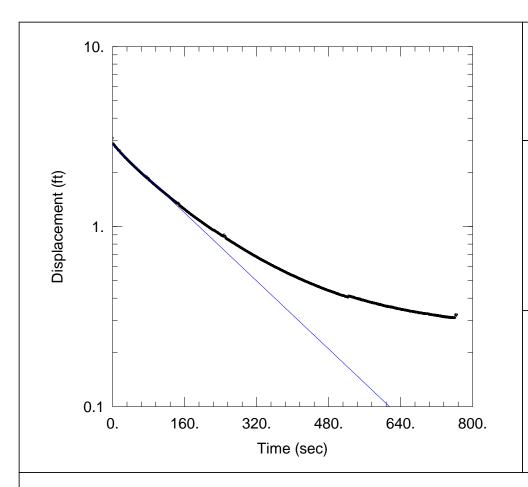
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01I)

Initial Displacement: 4.2 ft
Total Well Penetration Depth: 10. ft

Static Water Column Height: 11.43 ft
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-02D SLUG IN 1

Data Set: T:\...\UFMW-02D_slugin_1.aqt

Date: 05/04/17 Time: 10:01:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.112}{2.849}$ ft/day

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02D)

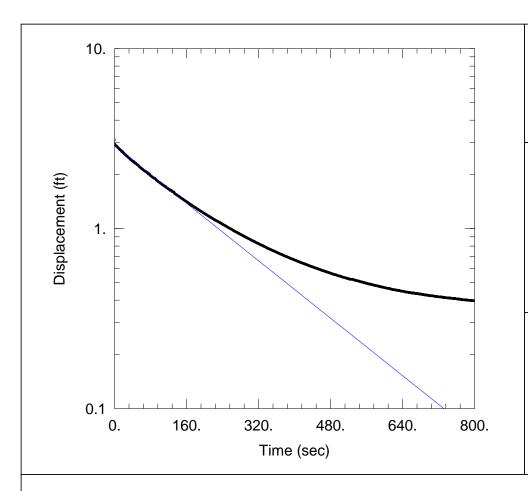
Initial Displacement: 3.1 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 20.98 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-02D SLUG IN 2

Data Set: T:\...\UFMW-02D_slugin_2.aqt

Date: 05/04/17 Time: 10:02:03

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9389 ft/day

y0 = 2.881 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-02D)

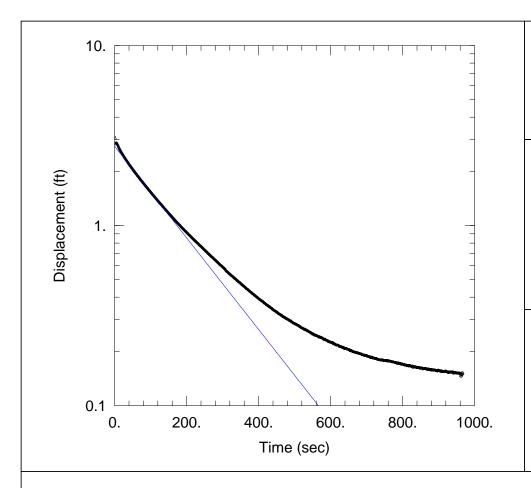
Initial Displacement: 3.1 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 20.98 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-02D SLUG OUT 1

Data Set: T:\...\UFMW-02D_slugout_1.aqt

Date: 05/04/17 Time: 10:02:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.198}{2.762}$ ft/day y0 = $\frac{2.762}{2.762}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02D)

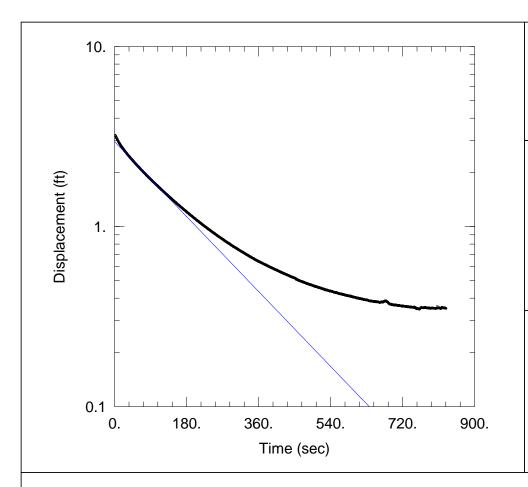
Initial Displacement: 3.1 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 20.98 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



Casing Radius: 0.083 ft

UFMW-02D SLUG OUT 2

Data Set: T:\...\UFMW-02D_slugout_2.aqt

Date: 05/04/17 Time: 10:02:18

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.089 ft/dayy0 = 2.966 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02D)

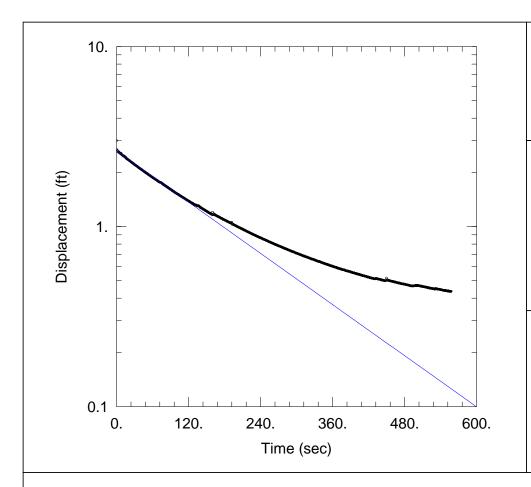
Initial Displacement: 3.2 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 20.98 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft



UFMW-02I SLUG IN 1

Data Set: T:\...\UFMW-02I_slugin_1.aqt

Date: 05/04/17 Time: 10:02:33

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-02I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.986 ft/dayy0 = 2.626 ft

AQUIFER DATA

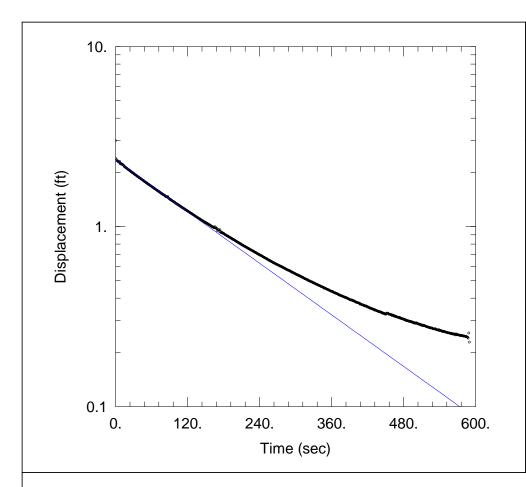
Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-02I)

Initial Displacement: 3. ft Static Water Column Height: 11.24 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 10. ft



UFMW-02I SLUG IN 2

Data Set: T:\...\UFMW-02I_slugin_2.aqt

Date: 05/04/17 Time: 10:02:42

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-02I Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.994 ft/day

 $y0 = \overline{2.34} \text{ ft}$

AQUIFER DATA

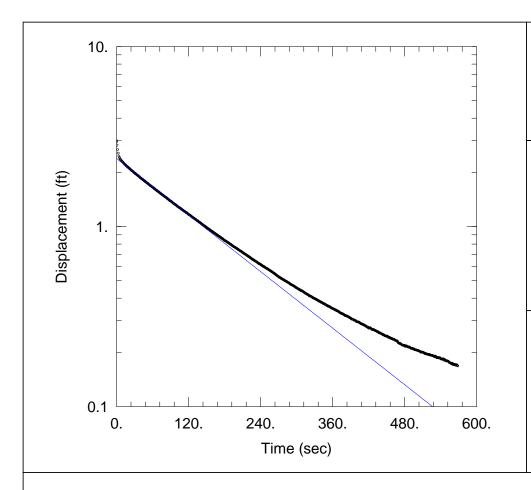
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02I)

Initial Displacement: 3. ft Static Water Column Height: 11.24 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 10. ft



UFMW-02I SLUG OUT 1

Data Set: T:\...\UFMW-02I_slugout_1.aqt

Date: 05/04/17 Time: 10:02:50

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.09}{2.389}$ ft/day y0 = $\frac{1.09}{2.389}$ ft

AQUIFER DATA

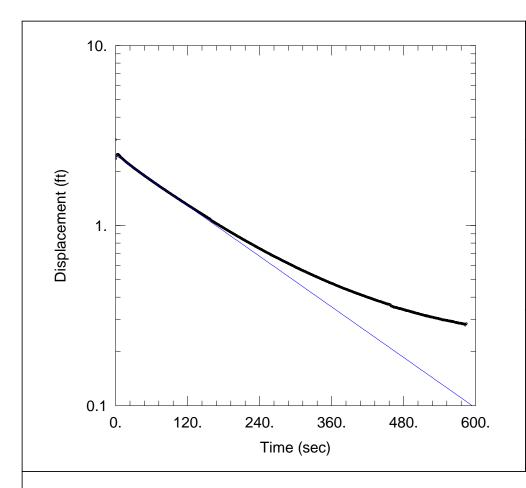
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02I)

Initial Displacement: 3. ft Static Water Column Height: 11.24 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 10. ft



UFMW-02I SLUG OUT 2

Data Set: T:\...\UFMW-02I_slugout_2.aqt

Date: 05/04/17 Time: 10:02:58

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.975 ft/dayy0 = 2.464 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

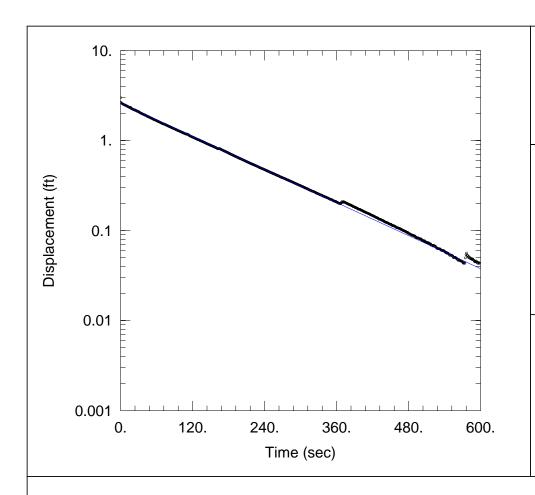
WELL DATA (UFMW-02I)

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 11.24 ft
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-03D SLUG IN 1

Data Set: T:\...\UFMW-03D_slugin_1.aqt

Date: 05/04/17 Time: 10:03:06

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03D Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.482 ft/dayy0 = 2.584 ft

AQUIFER DATA

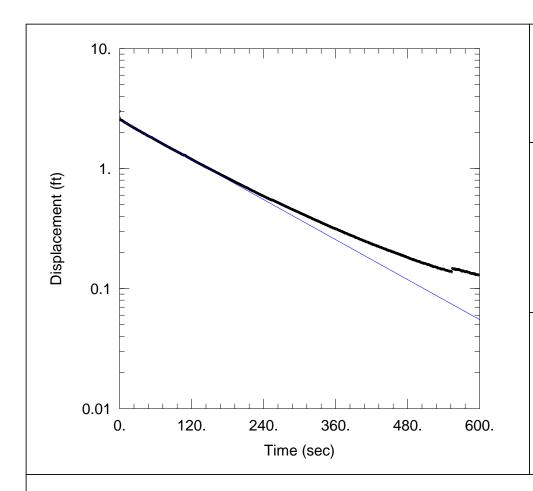
Saturated Thickness: 5.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03D)

Initial Displacement: 3. ft Static Water Column Height: 23.04 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 24. ft



Casing Radius: 0.083 ft

UFMW-03D SLUG IN 2

Data Set: T:\...\UFMW-03D_slugin_2.aqt

Date: 05/04/17 Time: 10:03:15

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.346}{2.561}$ ft/day y0 = 2.561 ft

AQUIFER DATA

Saturated Thickness: <u>5.5</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-03D)

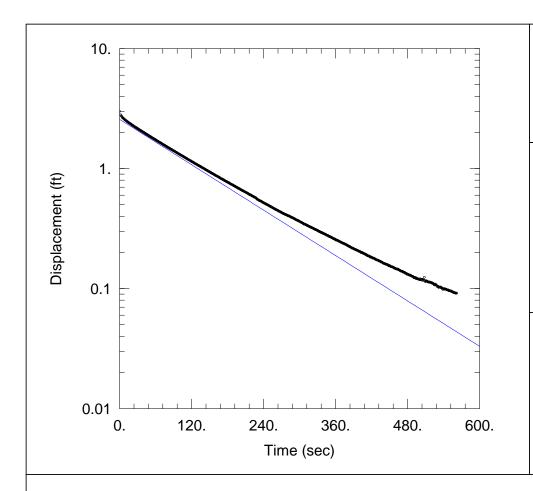
Initial Displacement: 3. ft

Total Well Penetration Depth: 24. ft

Static Water Column Height: 23.04 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-03D SLUG OUT 1

Data Set: T:\...\UFMW-03D_slugout_1.aqt

Date: 05/04/17 Time: 10:03:23

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03D Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.527 ft/dayy0 = 2.572 ft

AQUIFER DATA

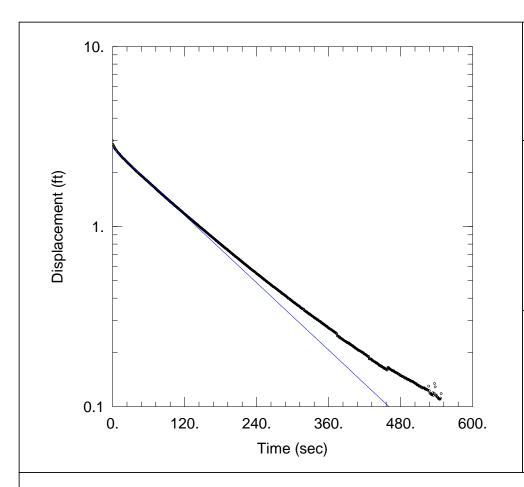
Saturated Thickness: 5.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03D)

Initial Displacement: 3. ft Static Water Column Height: 23.04 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 24. ft



Casing Radius: 0.083 ft

UFMW-03D SLUG OUT 2

Data Set: T:\...\UFMW-03D_slugout_2.aqt

Date: 05/04/17 Time: 10:04:51

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03D
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.51}{2.732}$ ft/day y0 = $\frac{1.51}{2.732}$ ft

AQUIFER DATA

Saturated Thickness: 5.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03D)

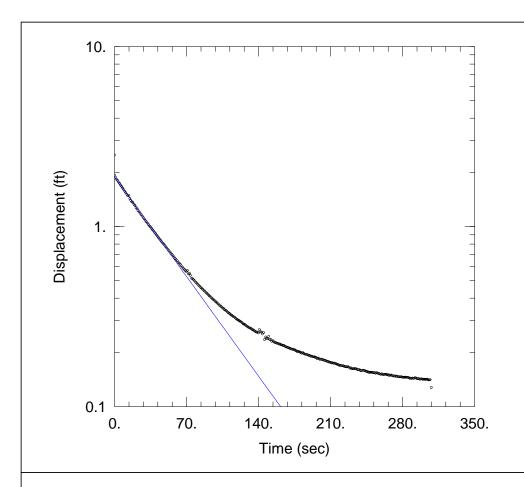
Initial Displacement: 3. ft

Total Well Penetration Depth: 24. ft

Static Water Column Height: 23.04 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-03I SLUG IN 1

Data Set: T:\...\UFMW-03I_slugin_1.aqt

Date: 05/04/17 Time: 10:04:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.841}{1.888}$ ft/day y0 = 1.888 ft

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

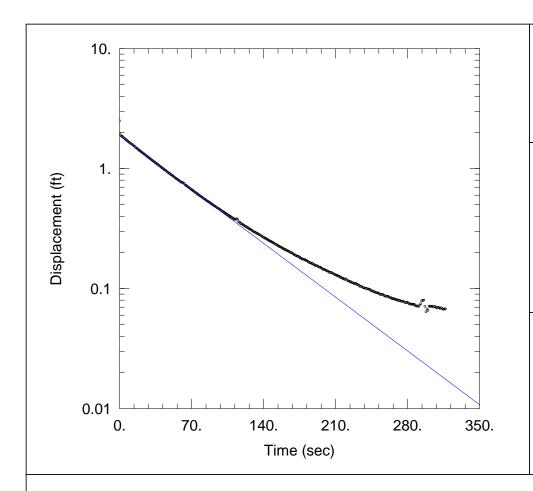
WELL DATA (UFMW-03I)

Static Water Column Height: 13.22 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Initial Displacement: 2.5 ft

Total Well Penetration Depth: 14. ft



UFMW-03I SLUG IN 2

Data Set: T:\...\UFMW-03I_slugin_2.aqt

Date: 05/04/17 Time: 10:05:07

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.491 ft/dayy0 = 1.878 ft

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

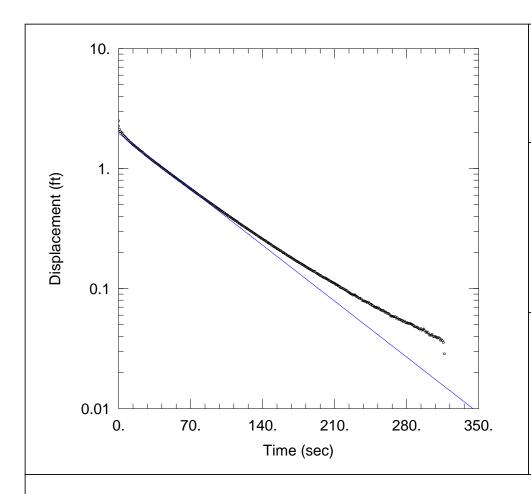
Initial Displacement: 2.5 ft

Total Well Penetration Depth: 14. ft

Static Water Column Height: 13.22 ft

Screen Length: 10. ft

Screen Length: 10. ft Well Radius: 0.5 ft



UFMW-03I SLUG OUT 1

Data Set: T:\...\UFMW-03I_slugout_1.aqt

Date: 05/04/17 Time: 10:05:14

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.55 ft/dayy0 = 1.968 ft

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

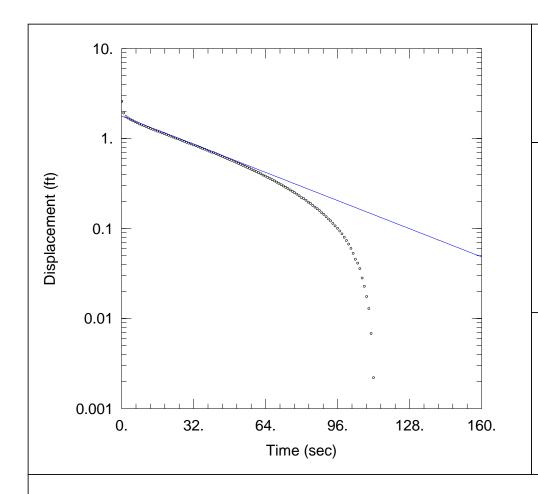
WELL DATA (UFMW-03I)

Static Water Column Height: 13.22 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Initial Displacement: 2.5 ft

Total Well Penetration Depth: 14. ft



UFMW-03I SLUG OUT 2

Data Set: T:\...\UFMW-03I_slugout_2.aqt

Date: 05/04/17 Time: 10:05:22

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 8/16/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.275 ft/dayy0 = 1.778 ft

AQUIFER DATA

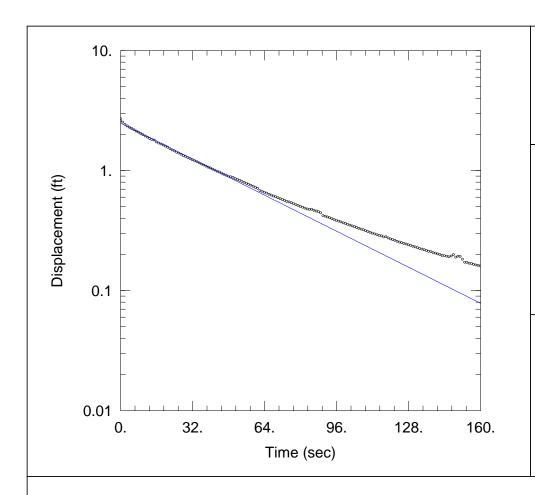
Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Initial Displacement: <u>2.6</u> ft Static Water Column Height: <u>13.22</u> ft

Screen Length: 10. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 14. ft Casing Radius: 0.083 ft



UFMW-04D SLUG IN 1

Data Set: T:\...\UFMW-04D_slugin_1.aqt

Date: 05/04/17 Time: 10:05:30

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04D
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.414}{2.484}$ ft/day y0 = $\frac{4.414}{2.484}$ ft

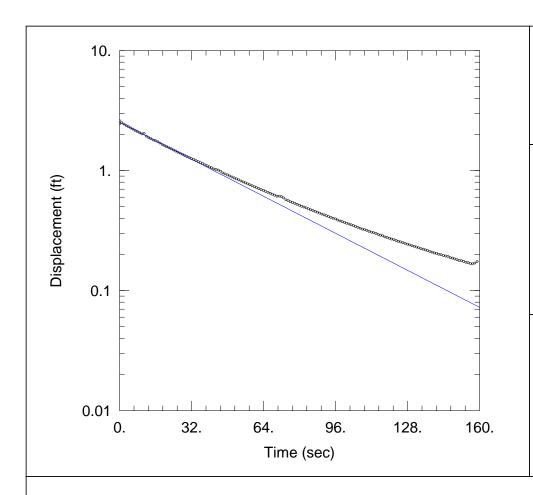
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04D)

Initial Displacement: <u>2.6</u> ft Static Water Column Height: <u>21.8</u> ft

Total Well Penetration Depth: 20. ft Screen Length: 5. ft Casing Radius: 0.083 ft Well Radius: 0.5 ft



UFMW-04D SLUG IN 2

Data Set: T:\...\UFMW-04D_slugin_2.aqt

Date: 05/04/17 Time: 10:05:55

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04D
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.537}{2.529}$ ft/day y0 = $\frac{2.529}{1}$ ft

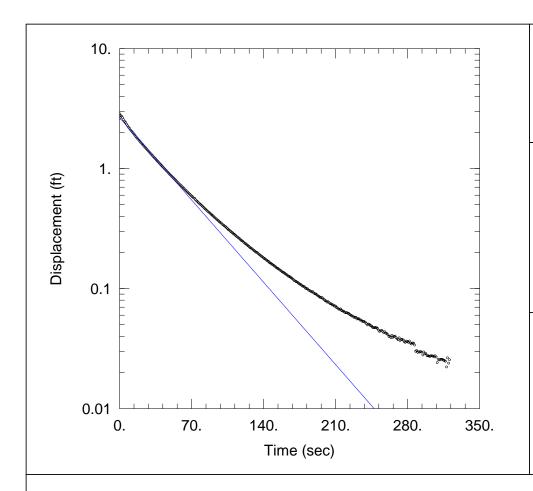
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04D)

Initial Displacement: <u>2.6 ft</u>
Total Well Penetration Depth: 20. ft
Static Water Column Height: <u>21.8 ft</u>
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-04D SLUG OUT 1

Data Set: T:\...\UFMW-04D_slugout_1.aqt

Date: 05/04/17 Time: 10:06:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04D
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.612}{2.658}$ ft/day y0 = $\frac{4.612}{2.658}$ ft

AQUIFER DATA

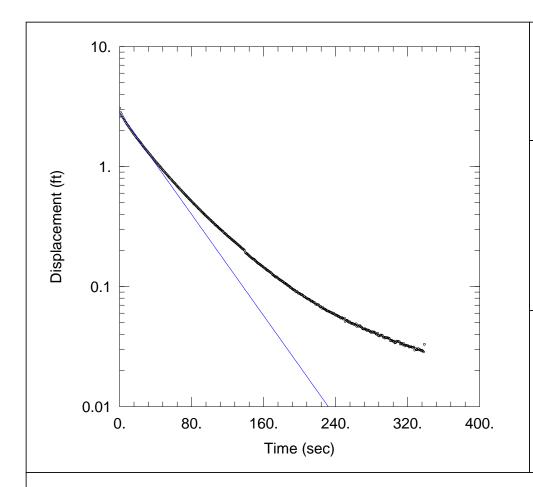
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04D)

Initial Displacement: 2.6 ft Static Water Column Height: 21.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: <u>20.</u> ft Casing Radius: 0.083 ft



UFMW-04D SLUG OUT 2

Data Set: T:\...\UFMW-04D_slugout_2.aqt

Date: 05/04/17 Time: 10:06:11

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-04D Test Date: 8/16/2016

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.962 ft/dayy0 = 2.786 ft

AQUIFER DATA

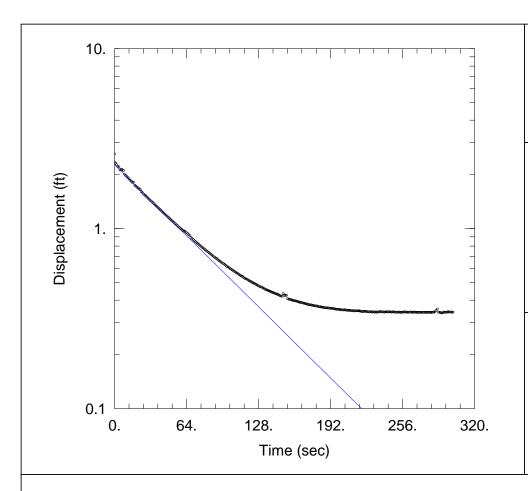
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04D)

Initial Displacement: 2.6 ft Static Water Column Height: 21.8 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 20. ft



UFMW-04I SLUG IN 1

Data Set: T:\...\UFMW-04I_slugin_1.aqt

Date: 05/04/17 Time: 10:06:18

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-041
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.568 ft/dayy0 = 2.264 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

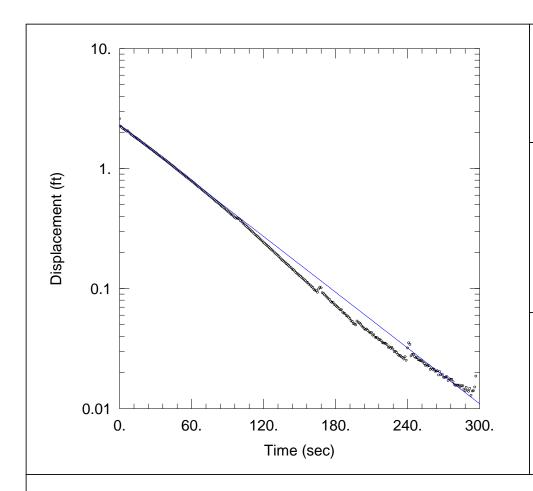
WELL DATA (UFMW-04D)

Static Water Column Height: 11.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.6 ft

Total Well Penetration Depth: 10. ft



UFMW-04I SLUG IN 2

Data Set: T:\...\UFMW-04I_slugin_2.aqt

Date: 05/04/17 Time: 10:06:26

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-041
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{3.224}{2.24}$ ft/day

y0 = 2.31 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

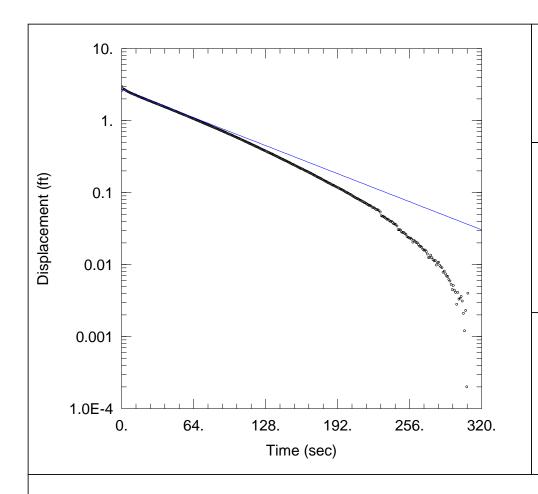
WELL DATA (UFMW-04I)

Static Water Column Height: 11.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.6 ft

Total Well Penetration Depth: 10. ft



Casing Radius: 0.083 ft

UFMW-04I SLUG OUT 1

Data Set: T:\...\UFMW-04I_slugout_1.aqt

Date: 05/04/17 Time: 10:06:34

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-041
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.535 ft/dayy0 = 2.705 ft

AQUIFER DATA

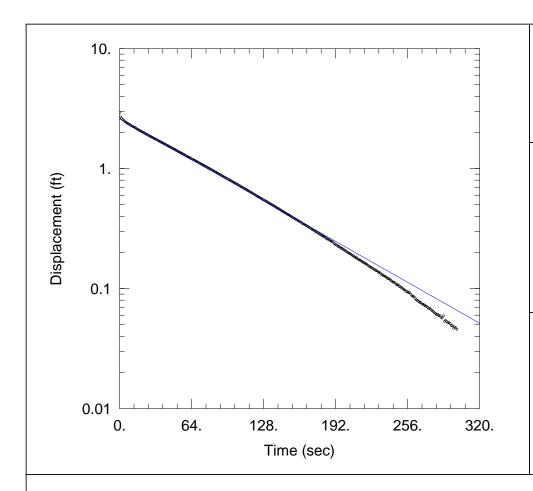
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04I)

Initial Displacement: <u>2.6 ft</u>
Total Well Penetration Depth: 10. ft

Static Water Column Height: <u>11.8 ft</u>
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-04I SLUG OUT 2

Data Set: T:\...\UFMW-04I_slugout_2.aqt

Date: 05/04/17 Time: 10:06:41

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-041
Test Date: 8/17/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.218 ft/dayy0 = 2.611 ft

AQUIFER DATA

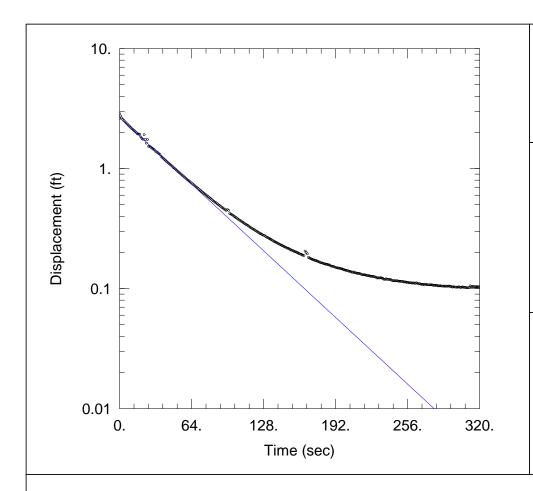
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04I)

Initial Displacement: 2.6 ft Static Water Column Height: 11.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: <u>10.</u> ft Casing Radius: 0.083 ft



UFMW-05D SLUG IN 1

Data Set: T:\...\UFMW-05D_slugin_1.aqt

Date: 05/04/17 Time: 10:06:49

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-05D Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.084}{2.665}$ ft/day y0 = $\frac{4.084}{2.665}$ ft

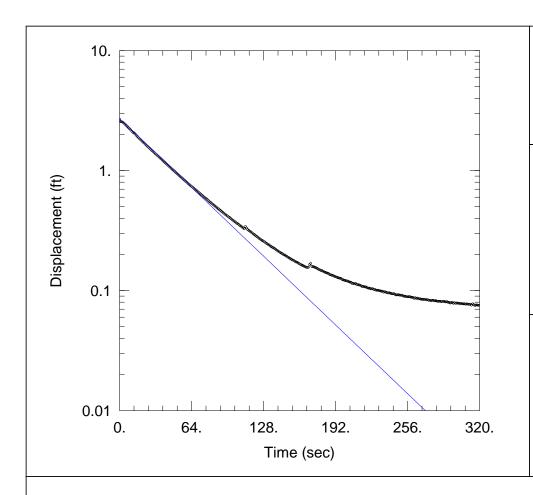
AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05D)

Initial Displacement: <u>2.6</u> ft Static Water Column Height: <u>21.9</u> ft Total Well Penetration Depth: 20. ft Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-05D SLUG IN 2

Data Set: T:\...\UFMW-05D_slugin_2.aqt

Date: 05/04/17 Time: 10:06:58

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.211}{2.703}$ ft/day y0 = $\frac{2.703}{2.703}$ ft

AQUIFER DATA

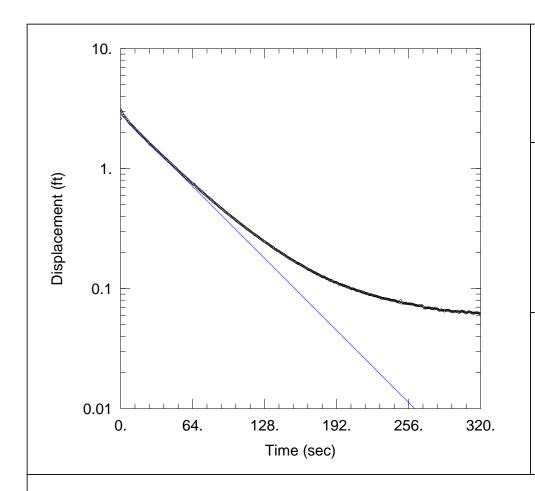
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05D)

Initial Displacement: 2.6 ft Static Water Column Height: 21.9 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: <u>20.</u> ft Casing Radius: 0.083 ft



UFMW-05D SLUG OUT 1

Data Set: T:\...\UFMW-05D_slugout_1.aqt

Date: 05/04/17 Time: 10:07:05

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.414}{2.834}$ ft/day y0 = $\frac{4.414}{2.834}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

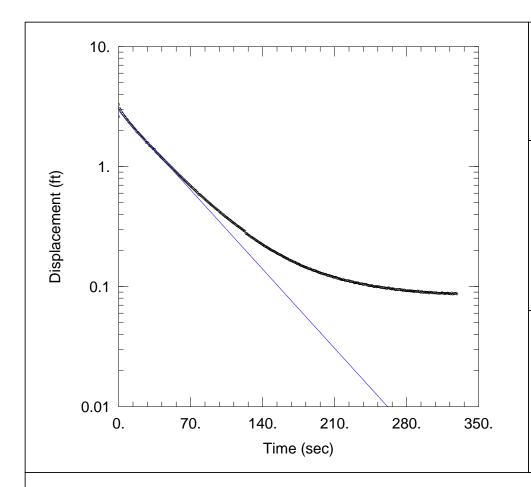
WELL DATA (UFMW-05D)

Static Water Column Height: 21.9 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.6 ft

Total Well Penetration Depth: 20. ft



UFMW-05D SLUG OUT 2

Data Set: T:\...\UFMW-05D_slugout_2.aqt

Date: 05/04/17 Time: 10:07:15

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-05D Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.439 ft/dayy0 = 2.925 ft

AQUIFER DATA

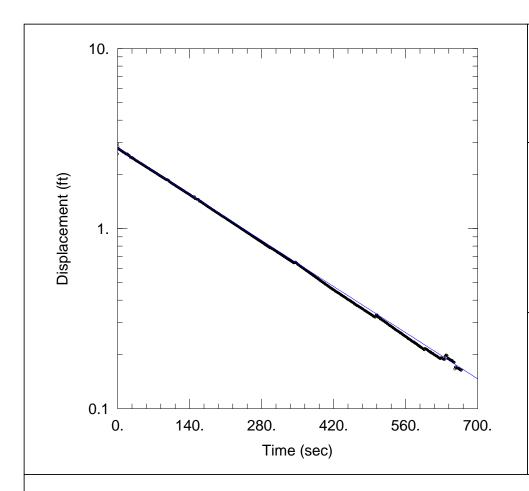
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05D)

Initial Displacement: 2.6 ft Static Water Column Height: 21.9 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 20. ft



UFMW-05I SLUG IN 1

Data Set: T:\...\UFMW-05I_slugin_1.aqt

Date: 05/04/17 Time: 10:07:24

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-05I Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.7624 ft/day

y0 = 2.802 ft

AQUIFER DATA

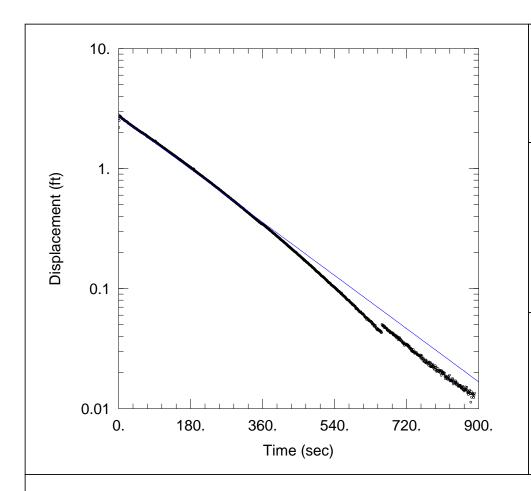
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05I)

Initial Displacement: 2.6 ft Static Water Column Height: 11.8 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 10. ft



UFMW-05I SLUG IN 2

Data Set: T:\...\UFMW-05I_slugin_2.aqt

Date: 05/04/17 Time: 10:07:32

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05I
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.025}{2.747}$ ft/day y0 = $\frac{1.025}{2.747}$ ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

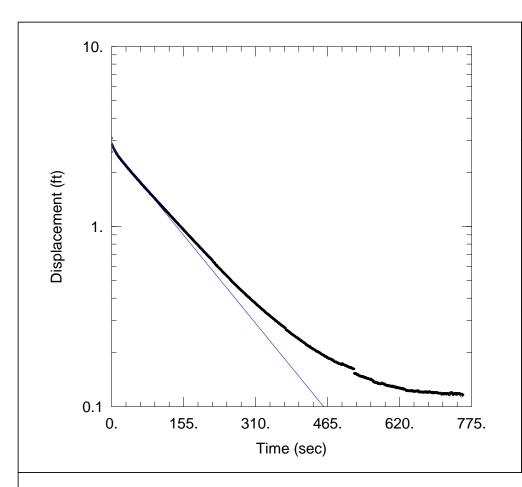
WELL DATA (UFMW-05I)

Static Water Column Height: 11.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.6 ft

Total Well Penetration Depth: 10. ft



Casing Radius: 0.083 ft

UFMW-05I SLUG OUT 1

Data Set: T:\...\UFMW-05I_slugout_1.aqt

Date: 05/04/17 Time: 10:07:40

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05I
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.316}{2.769}$ ft/day y0 = $\frac{2.769}{2.769}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05I)

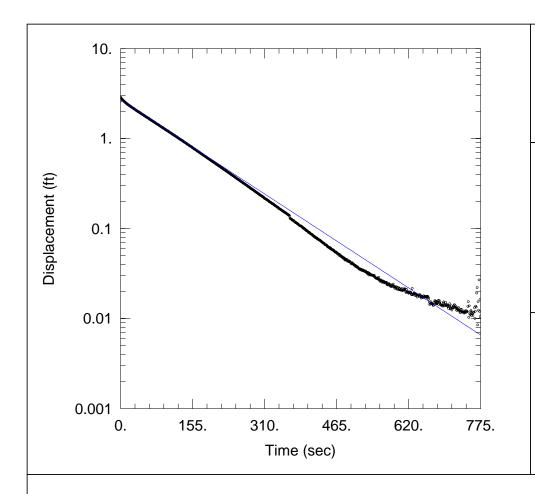
Initial Displacement: 2.6 ft

Total Well Penetration Depth: 10. ft

Static Water Column Height: 11.8 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-05I SLUG OUT 2

Data Set: T:\...\UFMW-05I_slugout_2.aqt

Date: 05/04/17 Time: 10:07:48

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05I
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.403}{2.004}$ ft/day

y0 = 2.69 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

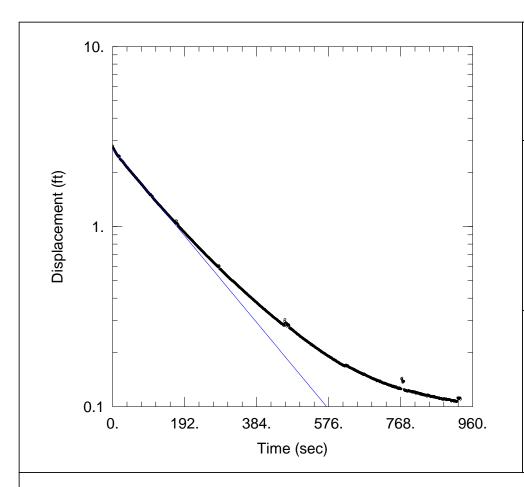
WELL DATA (UFMW-05I)

Static Water Column Height: 11.8 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.6 ft

Total Well Penetration Depth: 10. ft



Casing Radius: 0.083 ft

UFMW-06D SLUG IN 1

Data Set: T:\...\UFMW-06D_slugin_1.aqt

Date: 05/04/17 Time: 10:07:56

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.179}{2.691}$ ft/day y0 = 2.691 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-06D)

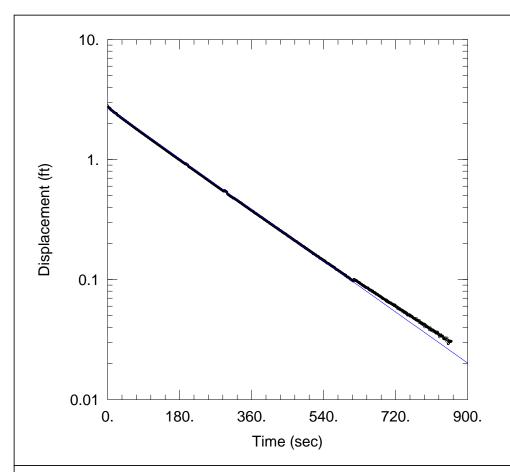
Initial Displacement: 2.8 ft

Total Well Penetration Depth: 20. ft

Static Water Column Height: 22.1 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft



UFMW-06D SLUG IN 2

Data Set: T:\...\UFMW-06D_slugin_2.aqt

Date: 05/04/17 Time: 10:08:05

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.113}{2.71}$ ft/day y0 = $\frac{1.113}{2.71}$ ft

AQUIFER DATA

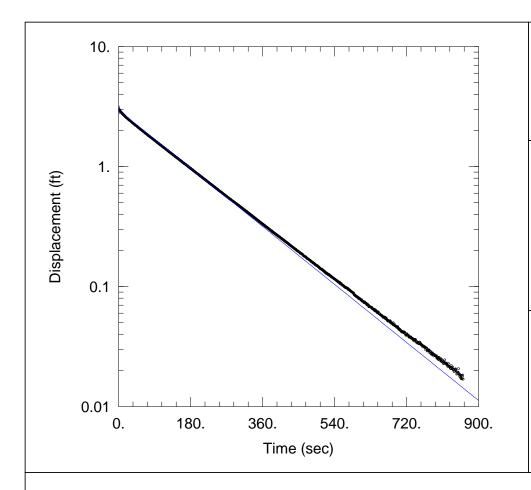
Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-06D)

Initial Displacement: 2.8 ft Static Water Column Height: 22.1 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft

Total Well Penetration Depth: 20. ft



UFMW-06D SLUG OUT 1

Data Set: T:\...\UFMW-06D_slugout_1.aqt

Date: 05/04/17 Time: 10:08:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.265}{2.944}$ ft/day

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

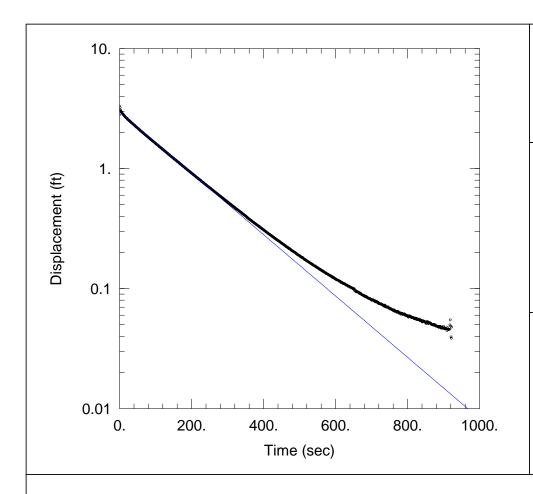
WELL DATA (UFMW-06D)

Static Water Column Height: 22.1 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.8 ft

Total Well Penetration Depth: 20. ft



UFMW-06D SLUG OUT 2

Data Set: T:\...\UFMW-06D_slugout_2.aqt

Date: 05/04/17 Time: 10:08:21

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 8/18/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.203}{2.963}$ ft/day y0 = $\frac{2.963}{2.963}$ ft

AQUIFER DATA

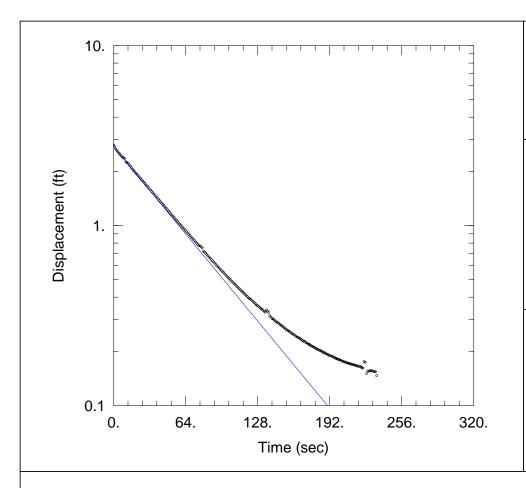
Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

WELL DATA (UFMW-06D)

Initial Displacement: 2.8 ft Static Water Column Height: 22.1 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 20. ft Casing Radius: 0.083 ft



UFMW-06I SLUG IN 1

Data Set: T:\...\UFMW-06I_slugin_1.aqt

Date: 05/04/17 Time: 10:08:59

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.149 ft/dayy0 = 2.744 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

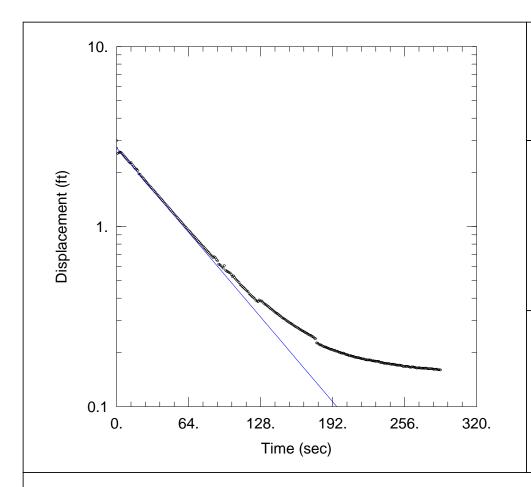
WELL DATA (UFMW-06I)

Static Water Column Height: 12.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.8 ft

Total Well Penetration Depth: 10. ft



UFMW-06I SLUG IN 2

Data Set: T:\...\UFMW-06I_slugin_2.aqt

Date: 05/04/17 Time: 10:09:08

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.059 ft/dayy0 = 2.744 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

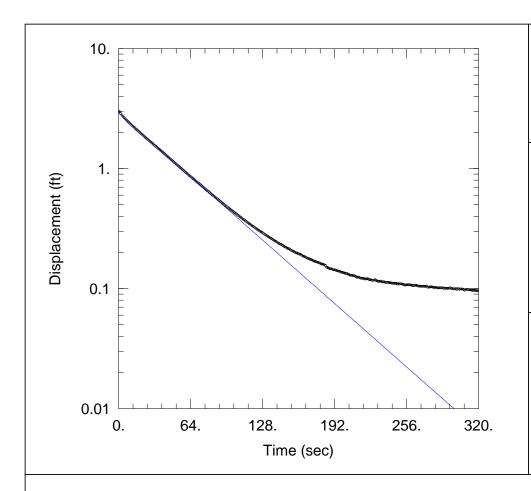
WELL DATA (UFMW-06I)

Static Water Column Height: 12.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFMW-06I SLUG OUT 1

Data Set: T:\...\UFMW-06I_slugout_1.aqt

Date: 05/04/17 Time: 10:09:16

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.438 ft/dayy0 = 2.894 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

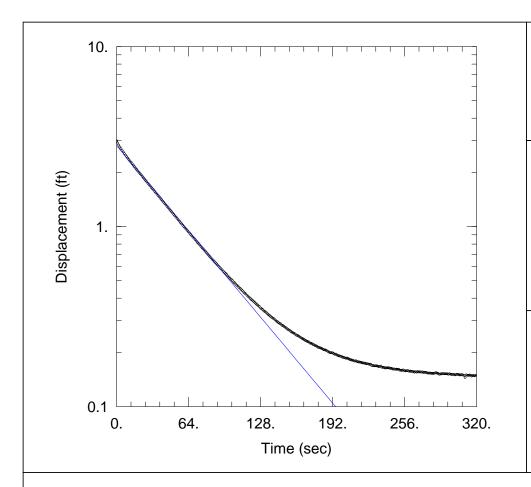
WELL DATA (UFMW-06I)

Static Water Column Height: 12.3 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFMW-06I SLUG OUT 2

Data Set: T:\...\UFMW-06I_slugout_2.aqt

Date: 05/04/17 Time: 10:09:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-06I Test Date: 8/29/2016

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.1 ft/dayy0 = 2.817 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

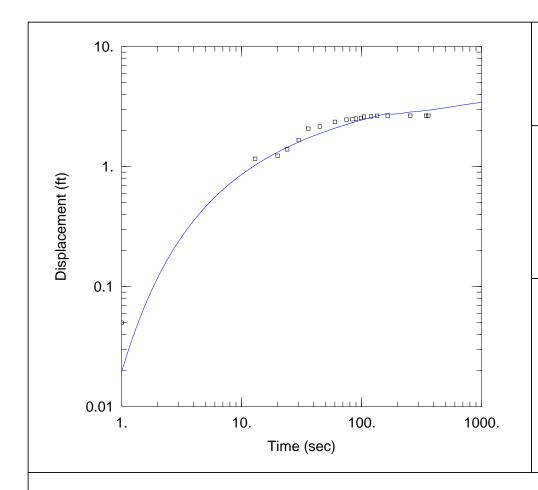
WELL DATA (UFMW-06I)

Static Water Column Height: 12.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 3. ft

Total Well Penetration Depth: 10. ft



UFIW-06I SHORT-TERM PUMPING TEST

Data Set: T:\...\UFIW-06I_PTddn.aqt

Date: 05/10/17 Time: 15:49:33

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 9/15/2016

SOLUTION

Aquifer Model: <u>Leaky</u> Solution Method: <u>Hantush</u>

 $T = 11.35 \text{ ft}^2/\text{day}$

 $S = \overline{0.01228}$

 $\beta = \overline{0.1}$

 $Kz/Kr = \overline{0.1}$

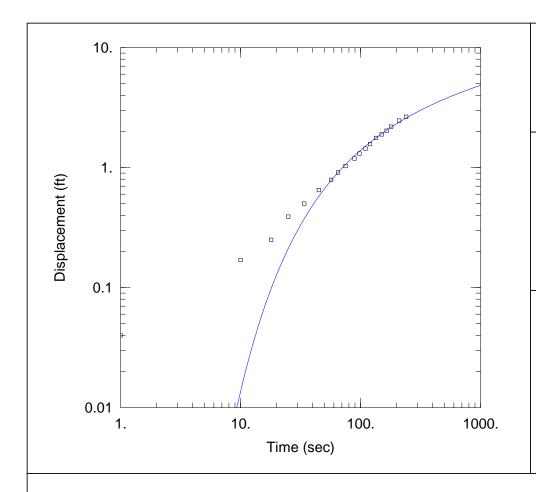
 $b = \overline{11.} \text{ ft}$

WELL DATA

Pumping Wells			
Well Name	X (ft)	Y (ft)	
UFIW-06I	0	0	

Well Name	X (ft)	Y (ft)
□ UFIW-06I	0	0

Observation Wells



UFIW-06I SHORT-TERM PUMPING TEST - RECOVERY

Data Set: T:\...\UFIW-06I_PTrec.aqt

Date: <u>05/10/17</u> Time: <u>15:48:47</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06I
Test Date: 9/15/2016

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: <u>Theis</u>

 $T = 6.277 \text{ ft}^2/\text{day}$

S = 0.08885

 $Kz/Kr = \overline{0.1}$

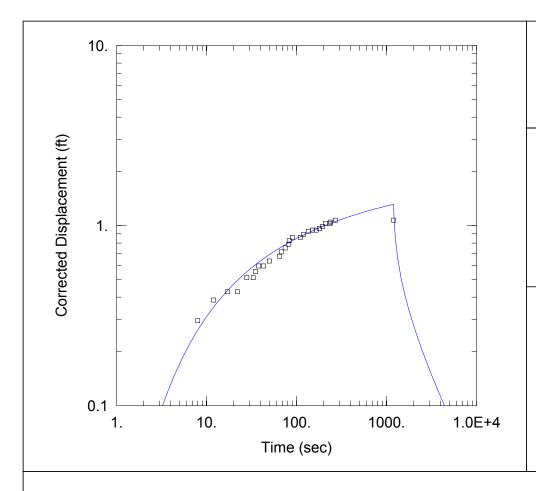
b = $\overline{11}$. ft

WELL DATA

١				
	Well Name	X (ft)	Y (ft)	Well Name
	UFIW-06I	0	0	□ UFIW-06I

Well Name	X (ft)	Y (ft)	
□ UFIW-06I	0	0	

Observation Wells



UFIW-06S SHORT-TERM PUMPING TEST

Data Set: C:\...\UFIW-06S_PTddn.aqt

Date: 11/18/16 Time: 13:57:30

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06S
Test Date: 9/15/2016

SOLUTION

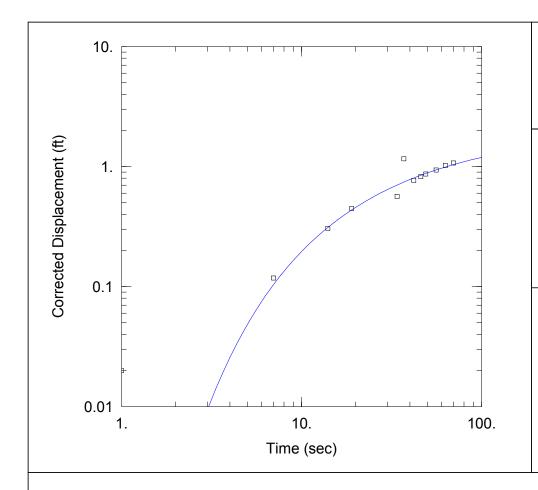
Aquifer Model: <u>Unconfined</u> Solution Method: <u>Theis</u>

T = $\frac{39}{0.0415}$ ft²/day

Kz/Kr = 0.1b = 3.41 ft

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
UFIW-06S	0	0	□ UFIW-06S	0	0
			•		



UFIW-06S SHORT-TERM PUMPING TEST - RECOVERY

Data Set: C:\...\UFIW-06S_PTrec.aqt

Date: 11/18/16 Time: 13:27:32

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-06S
Test Date: 9/15/2016

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: <u>Theis</u>

 $T = 15.21 \text{ ft}^2/\text{day}$

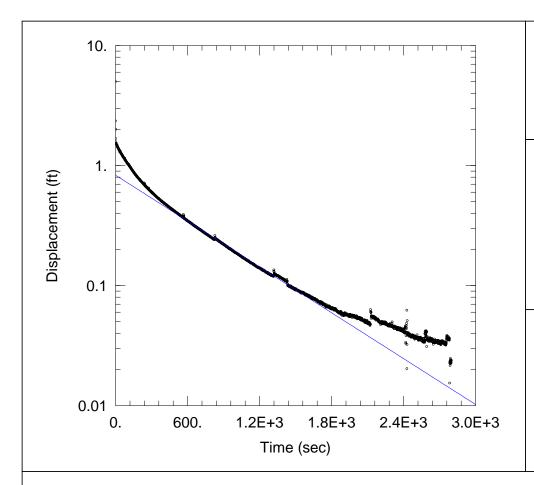
S = 0.05898

Kz/Kr = 0.1

 $= \overline{3.4} 1 \text{ ft}$

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
UFIW-06S	0	0	□ UFIW-06S	0	0



UFIW_01I_SLUGIN_1

Data Set: T:\...\UFIW_01I_slugin_1_MBQC.aqt

Date: 05/10/17

Time: 14:31:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW_01I Test Date: 4/11/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.2961 ft/day

y0 = 0.8309 ft

AQUIFER DATA

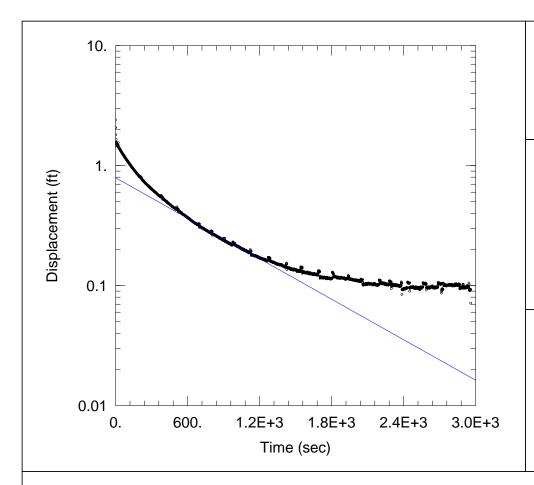
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_01I)

Initial Displacement: 5. ft Static Water Column Height: 10.95 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW_01I_SLUGIN_2

Data Set: T:\...\UFIW_01I_slugin_2_MBQC.aqt

Date: 05/10/17

Time: 14:32:07

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW_01I Test Date: 4/11/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.2615 ft/dayy0 = 0.7919 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

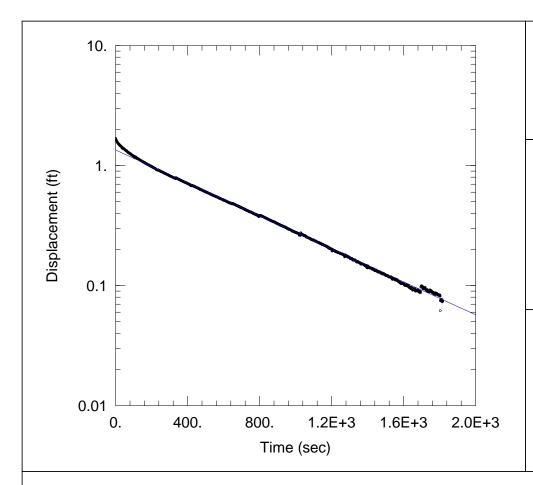
WELL DATA (UFIW_01I)

Static Water Column Height: 10.95 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Initial Displacement: 2.07 ft

Total Well Penetration Depth: 10. ft



UFIW_01I_SLUGOUT_1

Data Set: T:\...\UFIW_01I_slugout_1_MBQC.aqt
Date: 05/10/17 Time: 14:32:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.3194 ft/day

 $y0 = \overline{1.349} \, ft$

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

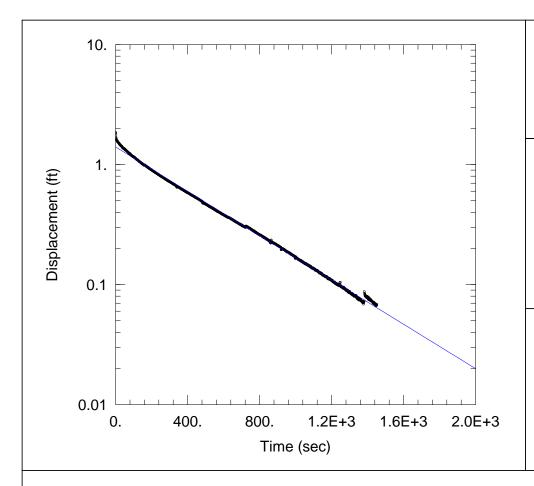
WELL DATA (UFIW_01I)

Static Water Column Height: 10.95 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 1.685 ft

Total Well Penetration Depth: 10. ft



UFIW_01I_SLUGOUT_2

Data Set: T:\...\UFIW_01I_slugout_2_MBQC.aqt
Date: 05/10/17 Time: 14:33:02

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4295 ft/day

 $y0 = \overline{1.402} \, ft$

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

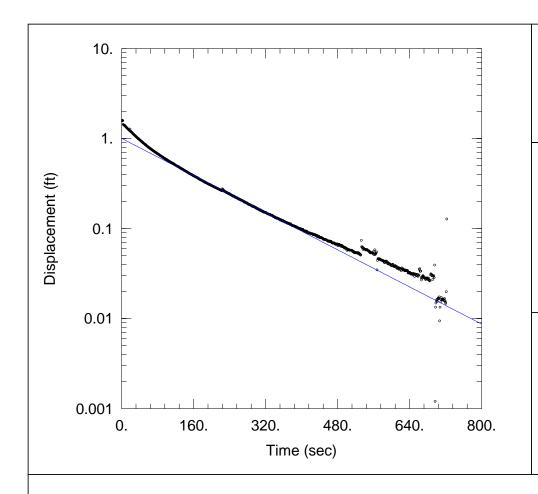
WELL DATA (UFIW_01I)

Static Water Column Height: 10.95 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 1.84 ft

Total Well Penetration Depth: 10. ft



UFIW_04I_SLUGIN_1

Data Set: T:\...\UFIW_04I_slugin_1.aqt

Date: 05/10/17 Time: 14:37:43

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.199}{1.005}$ ft/day y0 = 1.005 ft

AQUIFER DATA

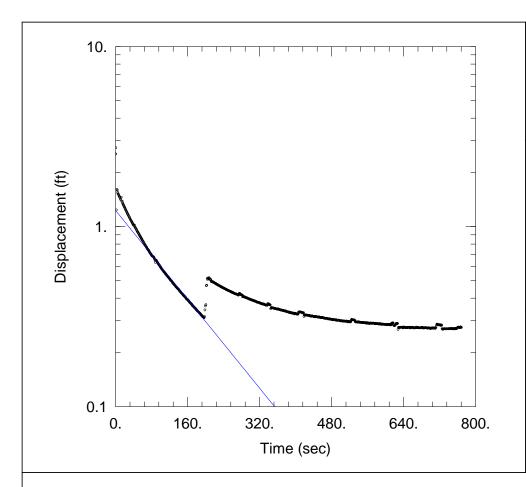
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_04I)

Initial Displacement: 1.57 ft Static Water Column Height: 11.91 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



Initial Displacement: 2.53 ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 10. ft

UFIW_04I_SLUGIN_2

Data Set: T:\...\UFIW_04I_slugin_2.aqt

Date: 05/10/17 Time: 14:38:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.431}{1.229}$ ft/day y0 = 1.229 ft

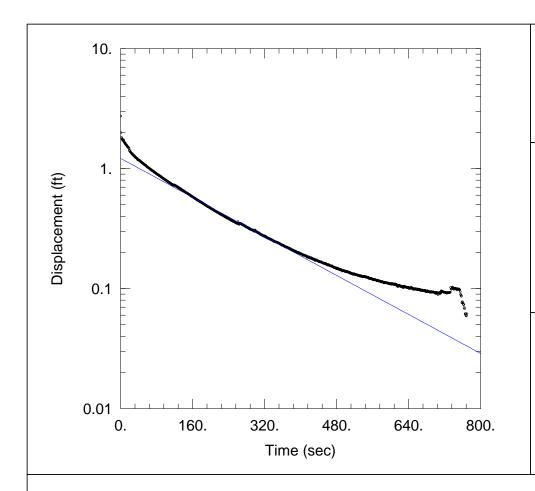
AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_04I)

Static Water Column Height: 11.91 ft

Screen Length: <u>5.</u> ft Well Radius: 0.333 ft



UFIW_04I_SLUGOUT_1

Data Set: T:\...\UFIW_04I_slugout_1.aqt

Date: 05/10/17 Time: 14:38:36

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9451 ft/day

 $y0 = \overline{1.217} \, ft$

AQUIFER DATA

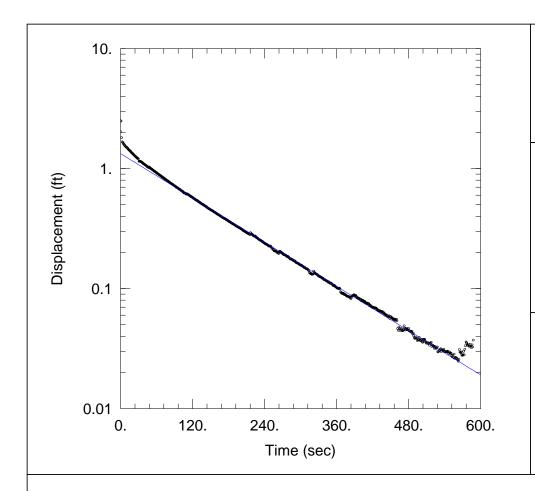
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_04I)

Initial Displacement: 2.73 ft Static Water Column Height: 11.91 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>10.</u> ft Casing Radius: 0.083 ft



UFIW_04I_SLUGOUT_2

Data Set: T:\...\UFIW_04I_slugout_2.aqt

Date: 05/10/17 Time: 14:38:56

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW_04I Test Date: 4/11/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.429 ft/day $y0 = \overline{1.332}$ ft

AQUIFER DATA

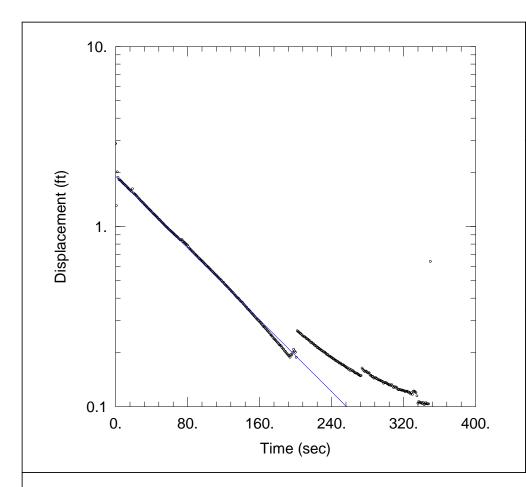
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_04I)

Initial Displacement: 2.5 ft Static Water Column Height: 11.91 ft

Screen Length: 5. ft Well Radius: 0.33 ft

Total Well Penetration Depth: 10. ft



UFIW_05I_SLUGIN_1

Data Set: T:\...\UFIW_05I_slugin_1.aqt

Date: 05/10/17 Time: 14:40:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_05I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.32 ft/dayy0 = 1.906 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

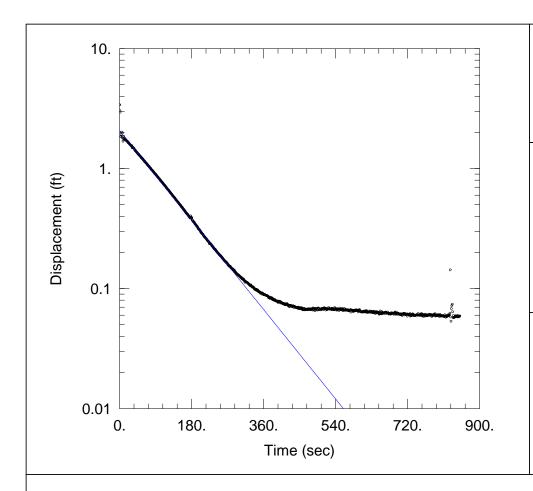
WELL DATA (UFIW_05I)

Static Water Column Height: 12.2 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 2.89 ft

Total Well Penetration Depth: 10. ft



UFIW_05I_SLUGIN_2

Data Set: T:\...\UFIW_05I_slugin_2.aqt

Date: 05/10/17 Time: 14:41:16

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_05I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.925 ft/dayy0 = 2.068 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

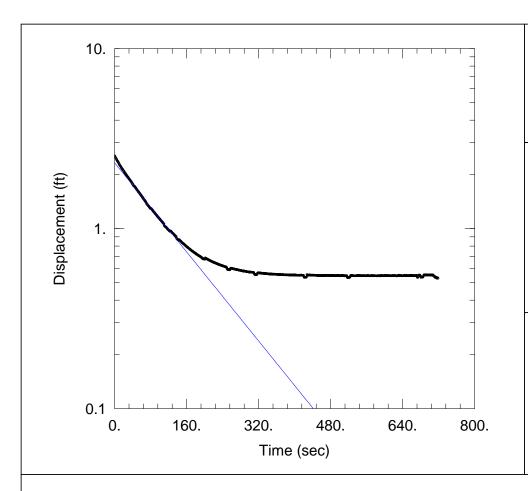
WELL DATA (UFIW_05I)

Static Water Column Height: 12.2 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.39 ft

Total Well Penetration Depth: 10. ft



UFIW_05I_SLUGOUT_1

Data Set: T:\...\UFIW_05I_slugout_1.aqt

Date: 05/10/17 Time: 14:42:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_05I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.439 ft/dayy0 = 2.323 ft

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

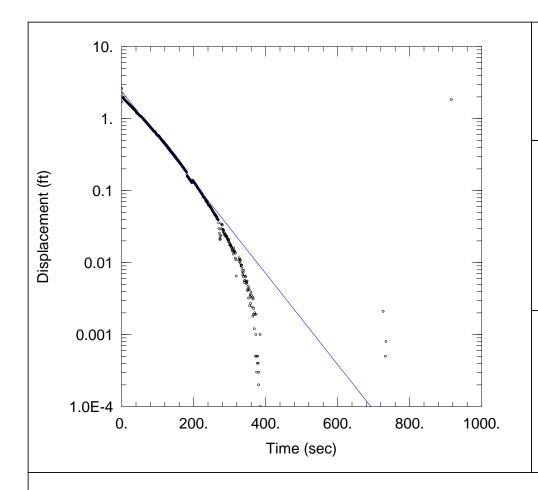
WELL DATA (UFIW_05I)

Static Water Column Height: 12.2 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 2.51 ft

Total Well Penetration Depth: 10. ft



UFIW_05I_SLUGOUT_2

Data Set: T:\...\UFIW_05I_slugout_2.aqt

Date: 05/10/17 Time: 14:43:12

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_05I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.943 ft/day

 $y0 = \overline{2.41} \text{ ft}$

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

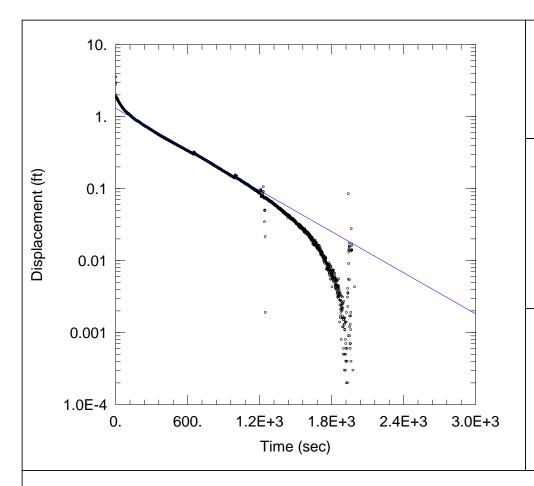
WELL DATA (UFIW_05I)

Static Water Column Height: 12.2 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 2.61 ft

Total Well Penetration Depth: 10. ft



UFIW_08I_SLUGIN_1

Data Set: T:\...\UFIW_08I_slugin_1.aqt

Date: 05/10/17 Time: 14:48:28

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_08I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4426 ft/day

 $y0 = \overline{1.305} \, ft$

AQUIFER DATA

Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

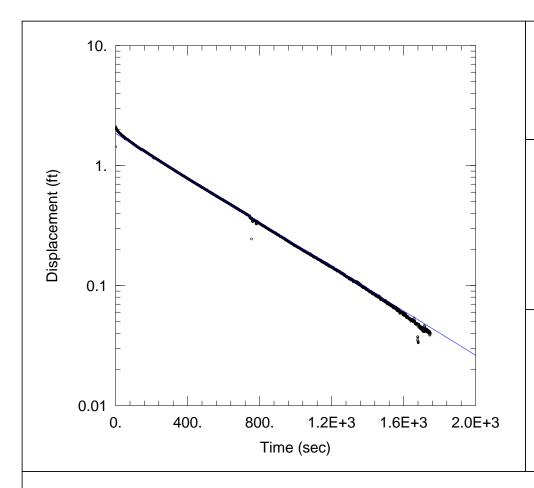
WELL DATA (UFIW_08I)

Static Water Column Height: 12.83 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.55 ft

Total Well Penetration Depth: 10. ft



UFIW_08I_SLUGOUT_1

Data Set: T:\...\UFIW_08I_slugout_1.aqt

Date: 05/10/17 Time: 14:49:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW_08I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.4295 ft/day

 $y0 = \overline{1.848} \, ft$

AQUIFER DATA

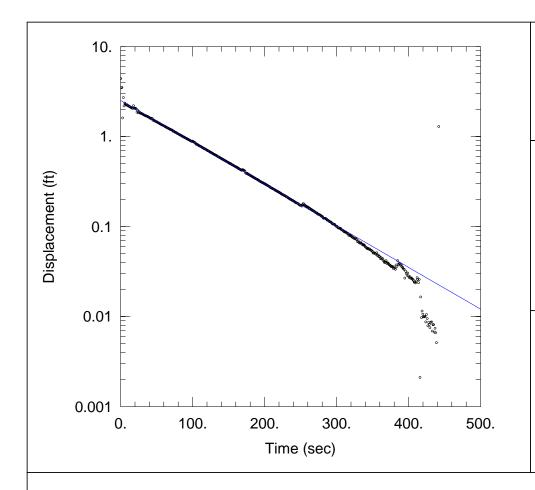
Saturated Thickness: 7. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW_08I)

Initial Displacement: 2.06 ft Static Water Column Height: 12.83 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Total Well Penetration Depth: <u>10.</u> ft Casing Radius: 0.083 ft



UFMW_01I_SLUGIN_1

Data Set: T:\...\UFMW_01I_slugin_1.aqt

Date: <u>04/27/17</u> Time: <u>10:27:22</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.301 ft/dayy0 = 2.527 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

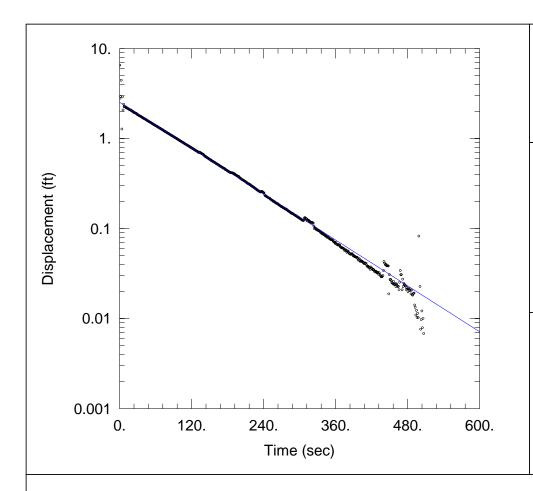
WELL DATA (UFMW_01I)

Static Water Column Height: 10.87 ft

Screen Length: <u>5.</u> ft Well Radius: 0.25 ft

Initial Displacement: 4.4 ft

Total Well Penetration Depth: 10. ft



UFMW_01I_SLUGIN_2

Data Set: T:\...\UFMW_01I_slugin_2.aqt

Date: 05/10/17 Time: 14:52:38

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.769}{2.531}$ ft/day y0 = 2.531 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

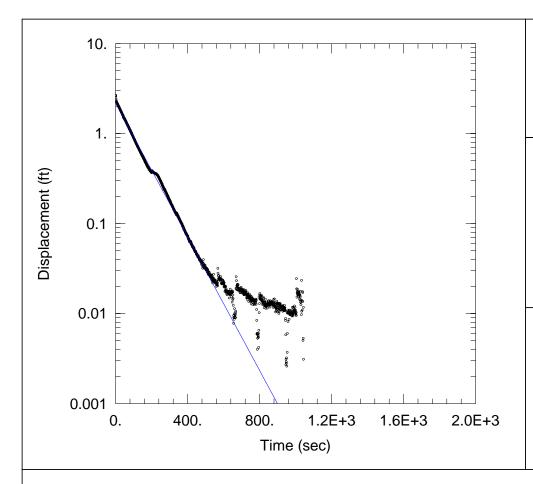
WELL DATA (UFMW_01I)

Static Water Column Height: 10.87 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 6.52 ft

Total Well Penetration Depth: 10. ft



UFMW_01I_SLUGOUT_1

Data Set: T:\...\UFMW_01I_slugout_1.aqt

Date: 05/10/17 Time: 14:53:30

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.841}{2.176}$ ft/day y0 = $\frac{1.841}{2.176}$ ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

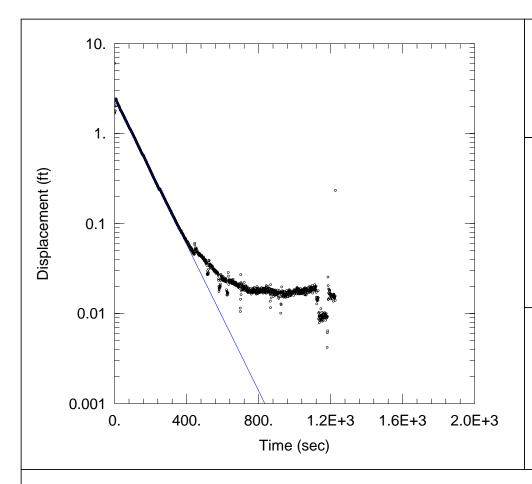
WELL DATA (UFMW_01I)

Static Water Column Height: 10.87 ft

Screen Length: <u>5.</u> ft Well Radius: 0.25 ft

Initial Displacement: 2.66 ft

Total Well Penetration Depth: 10. ft



UFMW_01I_SLUGOUT_2

Data Set: T:\...\UFMW_01I_slugout_2.aqt

Date: 05/10/17 Time: 14:54:11

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW_01I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.692 ft/dayy0 = 2.482 ft

AQUIFER DATA

Saturated Thickness: <u>6.</u> ft Anisotropy Ratio (Kz/Kr): <u>0.1</u>

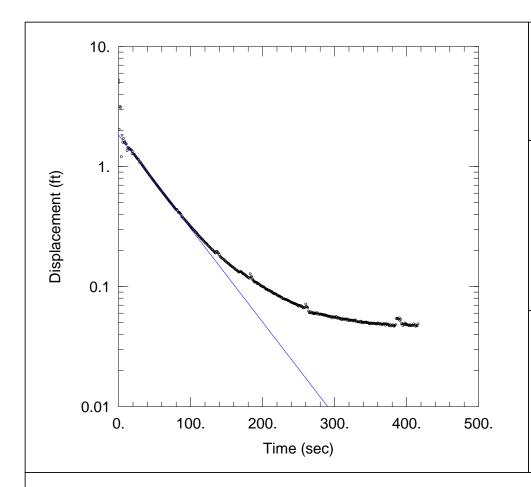
WELL DATA (UFMW_01I)

Static Water Column Height: 10.87 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 1.68 ft

Total Well Penetration Depth: 10. ft



Initial Displacement: 5. ft

Casing Radius: 0.083 ft

UFMW_03I_SLUGIN_1

Data Set: T:\...\UFMW_03I_slugin_1.aqt

Date: 05/10/17 Time: 14:55:57

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03I Test Date: 4/11/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.814 ft/day $y0 = \overline{1.833}$ ft

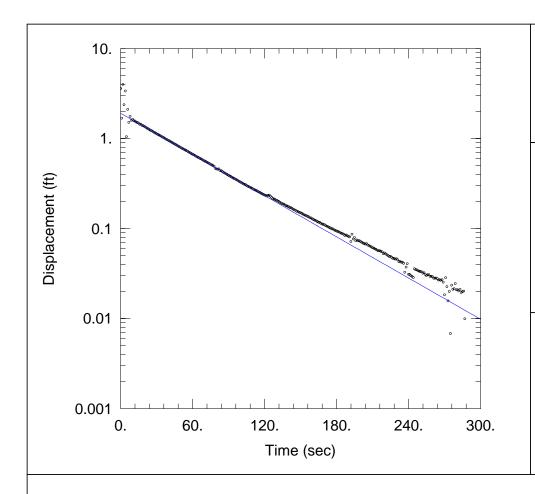
AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Static Water Column Height: 13.86 ft Total Well Penetration Depth: 14. ft

Screen Length: 10. ft Well Radius: 0.5 ft



UFMW_03I_SLUGIN_2

Data Set: T:\...\UFMW_03I_slugin_2.aqt

Date: 04/27/17 Time: 10:43:12

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.581 ft/dayy0 = 1.913 ft

AQUIFER DATA

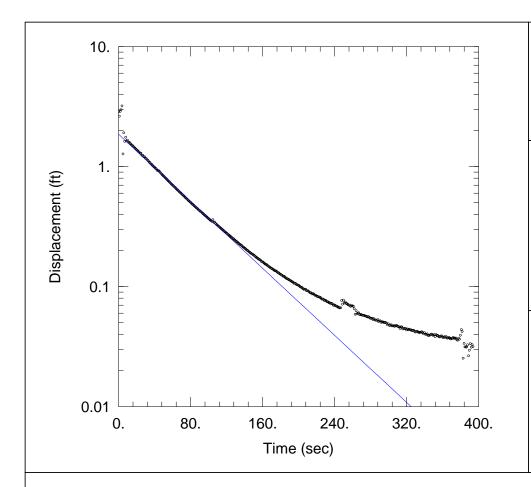
Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Initial Displacement: 3.6 ft
Total Well Penetration Depth: 14. ft

Static Water Column Height: 13.86 ft
Screen Length: 10. ft

Screen Length: 10. ft Well Radius: 0.25 ft



UFMW_03I_SLUGIN_3

Data Set: T:\...\UFMW_03I_slugin_3.aqt

Date: 05/10/17 Time: 14:57:08

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.626 ft/dayy0 = 1.863 ft

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

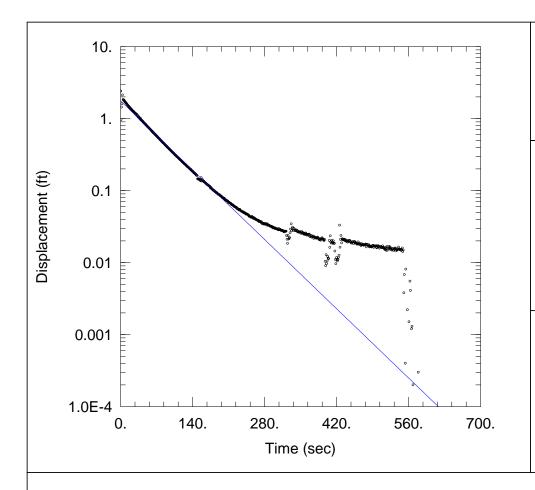
WELL DATA (UFMW-03I)

Static Water Column Height: 13.86 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Initial Displacement: 2.87 ft

Total Well Penetration Depth: 14. ft



UFMW_03I_SLUGOUT_1

Data Set: T:\...\UFMW_03I_slugout_1.aqt

Date: 05/10/17 Time: 14:58:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.599 ft/dayy0 = 1.759 ft

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

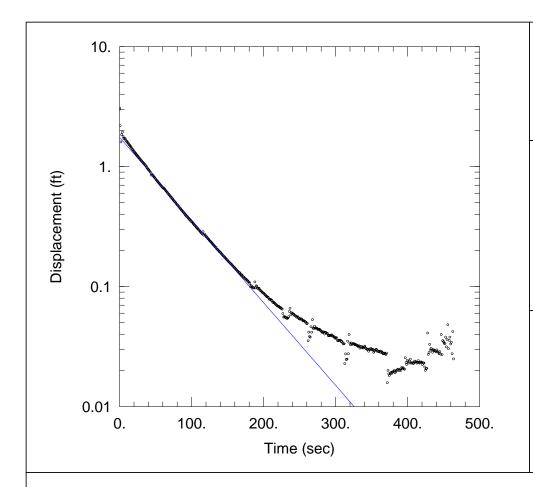
WELL DATA (UFMW-03I)

Static Water Column Height: 13.86 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Initial Displacement: 2.4 ft

Total Well Penetration Depth: 14. ft



UFMW_03I_SLUGOUT_2

Data Set: T:\...\UFMW_03I_slugout_2.aqt

Date: 05/10/17 Time: 15:03:34

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03I Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.603 ft/day $y0 = \overline{1.753}$ ft

AQUIFER DATA

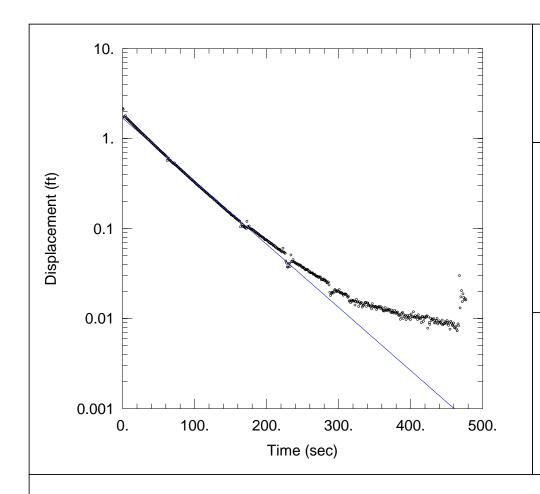
Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Initial Displacement: 3. ft Static Water Column Height: 13.86 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 14. ft



Initial Displacement: 2.16 ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 14. ft

UFMW_03I_SLUGOUT_3

Data Set: T:\...\UFMW_03I_slugout_3.aqt

Date: 05/10/17 Time: 15:04:08

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.632}{1.691}$ ft/day y0 = 1.691 ft

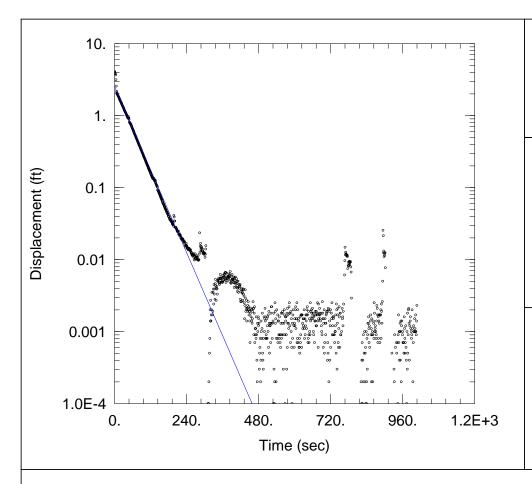
AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Static Water Column Height: 13.86 ft

Screen Length: 10. ft Well Radius: 0.5 ft



UFMW_04I_SLUGIN_1

Data Set: T:\...\UFMW_04I_slugin_1.aqt

Date: 05/10/17 Time: 15:06:10

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4. ft/dayy0 = 2.53 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

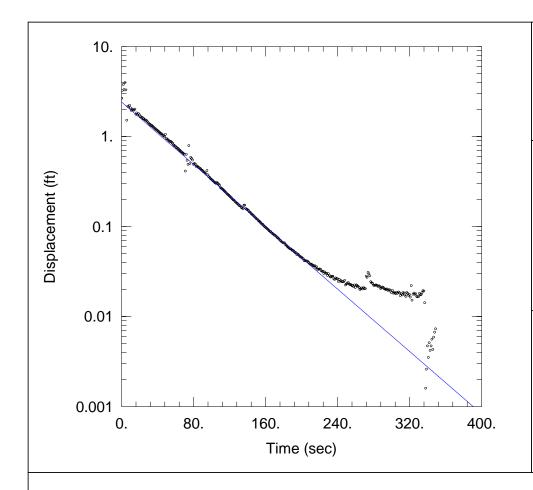
WELL DATA (UFMW-04I)

Static Water Column Height: 12.9 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 4. ft

Total Well Penetration Depth: 10. ft



UFMW_04I_SLUGIN_2

Data Set: T:\...\UFMW_04I_slugin_2.aqt

Date: 05/10/17 Time: 15:06:51

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.605 ft/dayy0 = 2.418 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

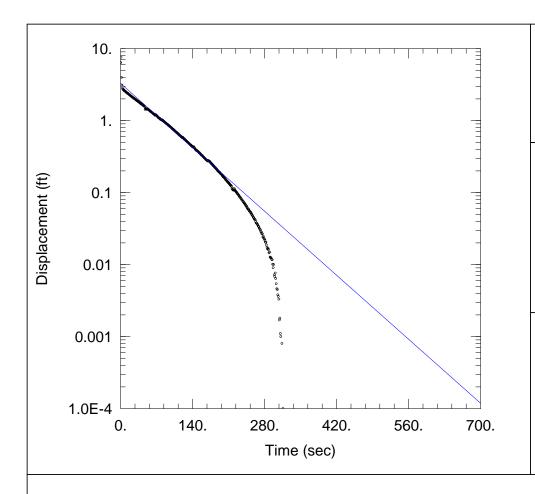
WELL DATA (UFMW-04I)

Static Water Column Height: 12.9 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 2.66 ft

Total Well Penetration Depth: 10. ft



UFMW_04I_SLUGOUT_1

Data Set: T:\...\UFMW_04I_slugout_1.aqt

Date: 05/10/17 Time: 15:07:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.643 ft/dayy0 = 3.291 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

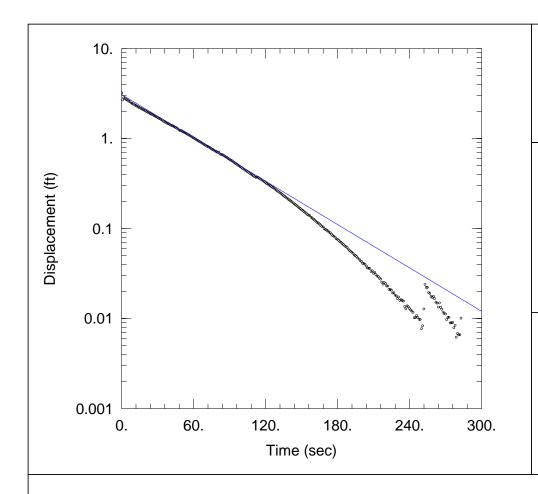
WELL DATA (UFMW-04I)

Static Water Column Height: 12.9 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft

Initial Displacement: 6.37 ft

Total Well Penetration Depth: 10. ft



UFMW_04I_SLUGOUT_2

Data Set: T:\...\UFMW_04I_slugout_2.aqt

Date: 05/10/17 Time: 15:08:16

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.344 ft/dayy0 = 3.095 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

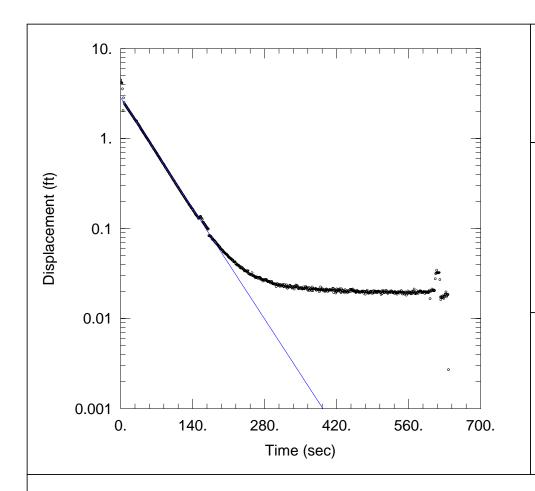
WELL DATA (UFMW-04I)

Static Water Column Height: 12.9 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft

Initial Displacement: 3.21 ft

Total Well Penetration Depth: 10. ft



UFMW_06I_SLUGIN_1

Data Set: T:\...\UFMW_06I_slugin_1_MBQC.aqt
Date: 05/10/17 Time: 15:09:19

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.659 ft/dayy0 = 2.862 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

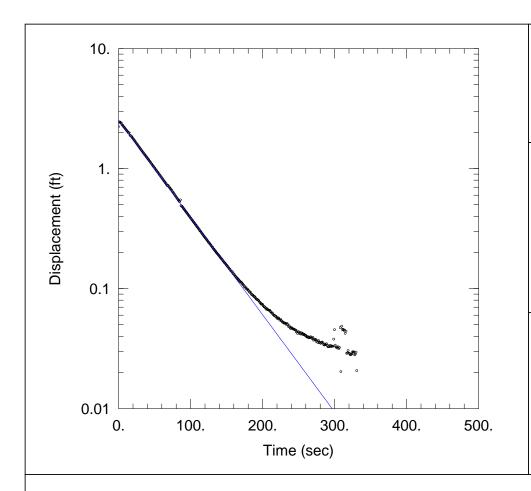
WELL DATA (UFMW-06I)

Static Water Column Height: 13.34 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 4.47 ft

Total Well Penetration Depth: 10. ft



Initial Displacement: 2.44 ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 13. ft

UFMW_06I_SLUGIN_2

Data Set: T:\...\UFMW_06I_slugin_2.aqt

Date: <u>04/27/17</u> Time: <u>11:01:24</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{2.167}{2.522}$ ft/day y0 = $\frac{2.522}{2.522}$ ft

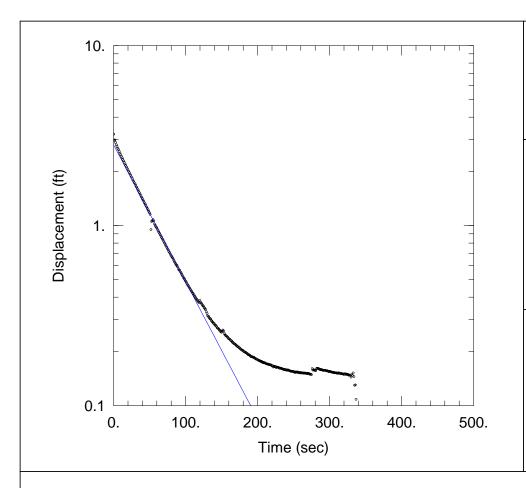
AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-06I)

Static Water Column Height: 13.34 ft

Screen Length: 10. ft Well Radius: 0.25 ft



UFMW_06I_SLUGOUT_1

Data Set: T:\...\UFMW_06I_slugout_1.aqt

Date: 05/10/17 Time: 15:10:04

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-06I Test Date: 4/11/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.169 ft/dayy0 = 2.811 ft

AQUIFER DATA

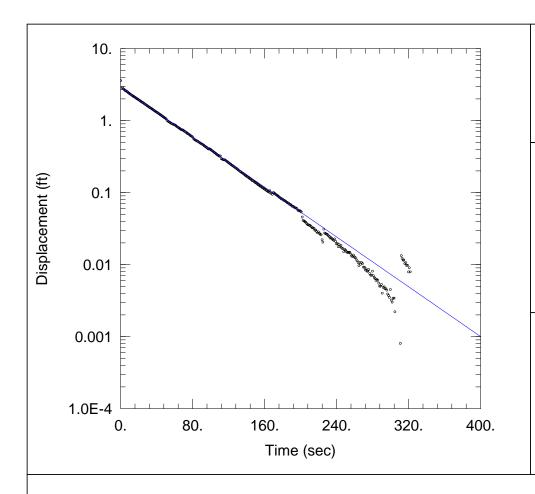
Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-06I)

Static Water Column Height: 13.34 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Initial Displacement: 3.22 ft Total Well Penetration Depth: 10. ft



UFMW_06I_SLUGOUT_2

Data Set: T:\...\UFMW_06I_slugout_2.aqt

Date: 05/10/17 Time: 15:10:33

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06I
Test Date: 4/11/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.601 ft/dayy0 = 2.882 ft

AQUIFER DATA

Saturated Thickness: 6. ft Anisotropy Ratio (Kz/Kr): 0.1

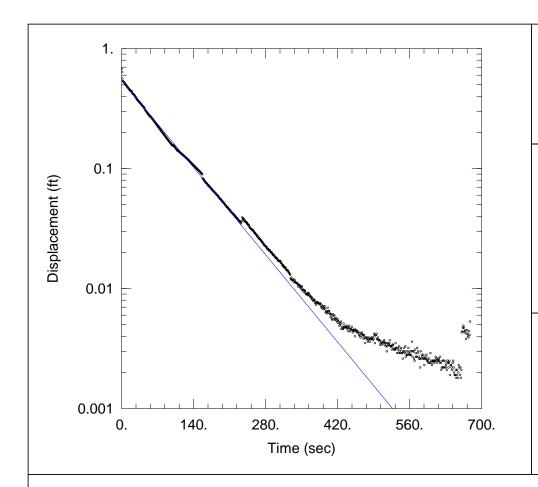
WELL DATA (UFMW-06I)

Static Water Column Height: 13.34 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 3.58 ft

Total Well Penetration Depth: 10. ft



UFMW-01D SLUG IN

Data Set: \...\UFMW_01D_slugin_1.aqt

Date: 10/25/17 Time: 10:46:16

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.409 ft/dayy0 = 0.5446 ft

AQUIFER DATA

Saturated Thickness: 8. ft

Anisotropy Ratio (Kz/Kr): 0.1

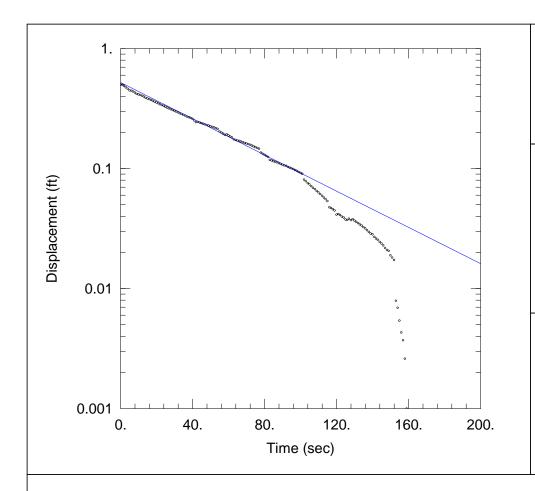
WELL DATA (UFMW-01D)

Static Water Column Height: 18.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 0.68 ft

Total Well Penetration Depth: 18.3 ft



UFMW-01D SLUG OUT

Data Set: \...\UFMW_01D_slugout_1.aqt

Date: 10/25/17 Time: 10:46:28

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 3.502 ft/dayy0 = 0.5219 ft

AQUIFER DATA

Saturated Thickness: 8. ft

Initial Displacement: 0.4997 ft

Casing Radius: 0.083 ft

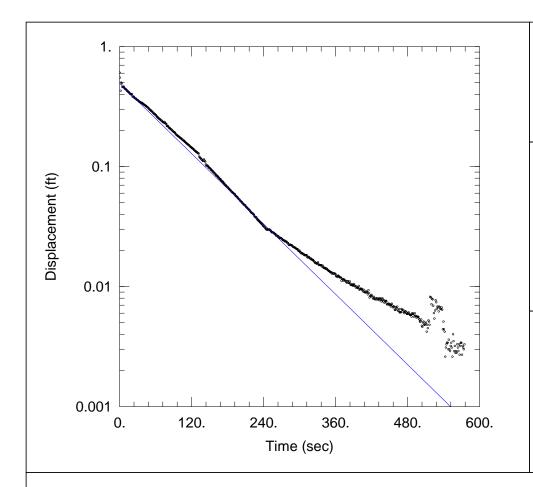
Total Well Penetration Depth: 18.3 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01D)

Static Water Column Height: 18.3 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-01I SLUG IN

Data Set: \...\UFMW_01I_slugin_1.aqt

Date: 10/25/17 Time: 10:46:41

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01I
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.97 ft/dayy0 = 0.4944 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

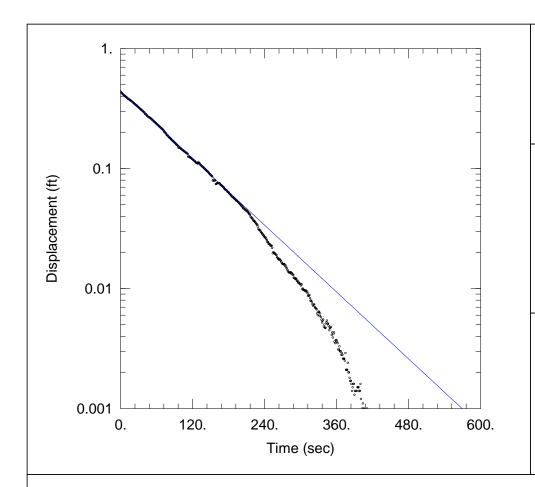
WELL DATA (UFMW-01I)

Static Water Column Height: 8.53 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 8.53 ft Casing Radius: 0.083 ft

Initial Displacement: 0.6053 ft



UFMW-01I SLUG IN

Data Set: \...\UFMW_01I_slugout_1.aqt

Date: 10/25/17 Time: 10:46:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-01I
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.873 ft/dayy0 = 0.4397 ft

AQUIFER DATA

Saturated Thickness: 6. ft

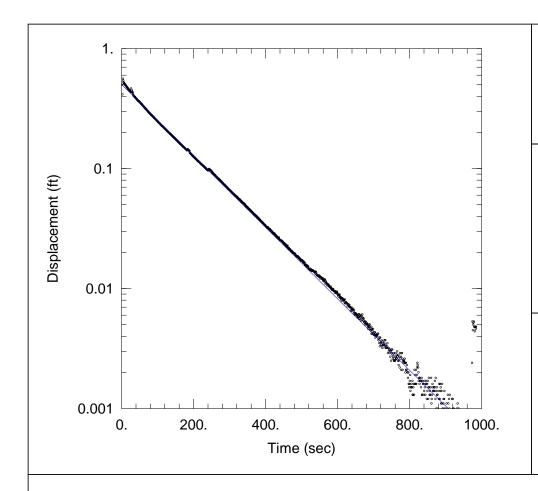
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-01I)

Static Water Column Height: 8.53 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: <u>0.4369</u> ft Total Well Penetration Depth: 8.53 ft



UFMW-02D SLUG IN

Data Set: \...\UFMW_02D_slugin_1.aqt

Date: 10/25/17 Time: 10:47:06

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{1.371}{0.5029}$ ft

AQUIFER DATA

Saturated Thickness: 8. ft

Anisotropy Ratio (Kz/Kr): 0.1

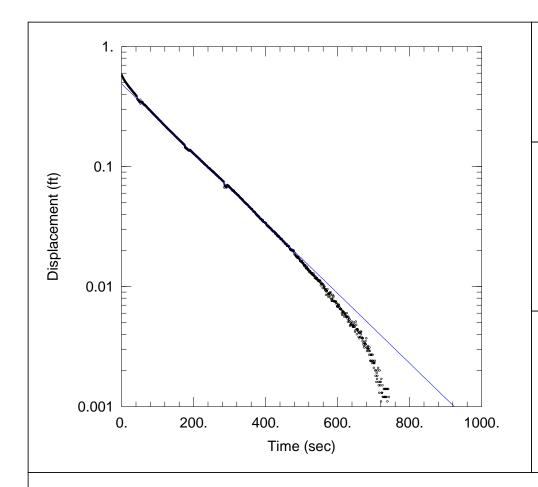
WELL DATA (UFMW-02D)

Static Water Column Height: 17.53 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 0.4994 ft

Total Well Penetration Depth: 17.53 ft



UFMW-02D SLUG OUT

Data Set: \...\UFMW_02D_slugout_1.aqt

Date: 10/25/17 Time: 10:47:18

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-02D Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.341 ft/day

y0 = 0.4899 ft

AQUIFER DATA

Saturated Thickness: 8. ft

Anisotropy Ratio (Kz/Kr): 0.1

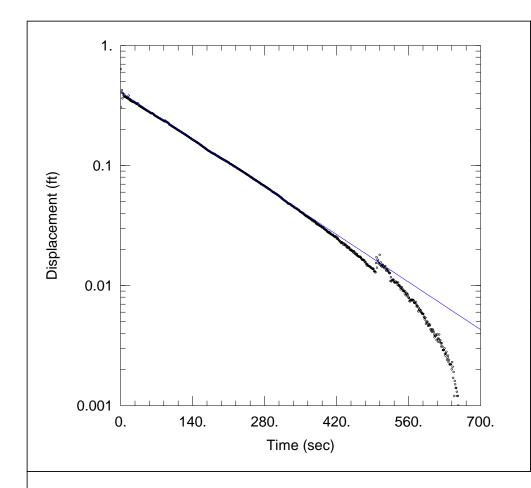
WELL DATA (UFMW-02D)

Static Water Column Height: 17.53 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 17.53 ft Casing Radius: 0.083 ft

Initial Displacement: 0.5823 ft



UFMW-02I SLUG IN

Data Set: \...\UFMW_02I_slugin_1.aqt

Date: 10/25/17

Time: 10:47:34

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-02I Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.193 ft/day

y0 = 0.411 ft

AQUIFER DATA

Saturated Thickness: 10. ft

Initial Displacement: 0.6363 ft

Casing Radius: 0.083 ft

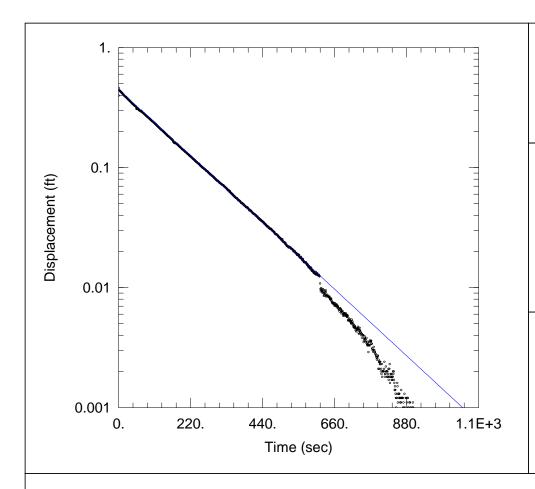
Total Well Penetration Depth: 10.69 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-02I)

Static Water Column Height: 10.69 ft

Screen Length: 5. ft Well Radius: 0.5 ft



UFMW-02I SLUG OUT

Data Set: \...\UFMW_02I_slugout_1.aqt

Date: 10/25/17 Time: 10:47:45

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-02I
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.064 ft/dayy0 = 0.4485 ft

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 0.1

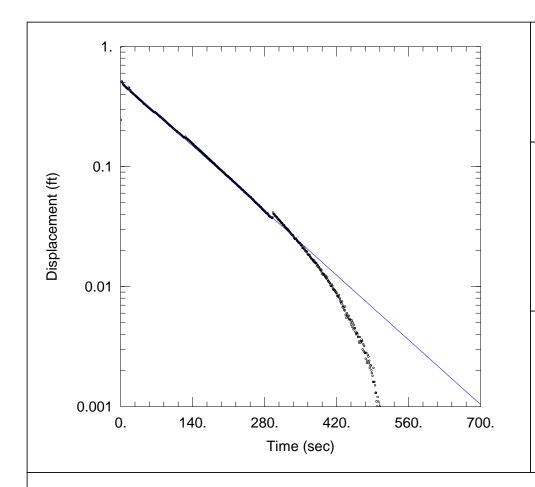
WELL DATA (UFMW-02I)

Static Water Column Height: 10.69 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 0.3977 ft

Total Well Penetration Depth: 10.69 ft



UFMW-03D SLUG IN

Data Set: \...\UFMW_03D_slugin_1.aqt

Date: 10/25/17 Time: 10:47:58

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.829 ft/dayy0 = 0.5149 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

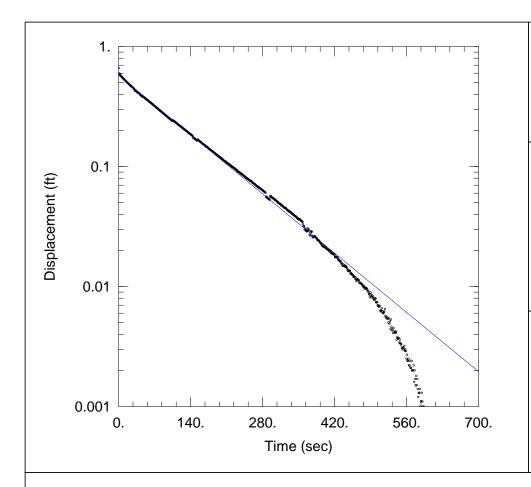
WELL DATA (UFMW-03D)

Static Water Column Height: 21.23 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 21.23 ft Casing Radius: 0.083 ft

Initial Displacement: 0.9933 ft



UFMW-03D SLUG OUT

Data Set: \...\UFMW_03D_slugout_1.aqt

Date: 10/25/17

Time: 10:53:33

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-03D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.676 ft/dayy0 = 0.5754 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

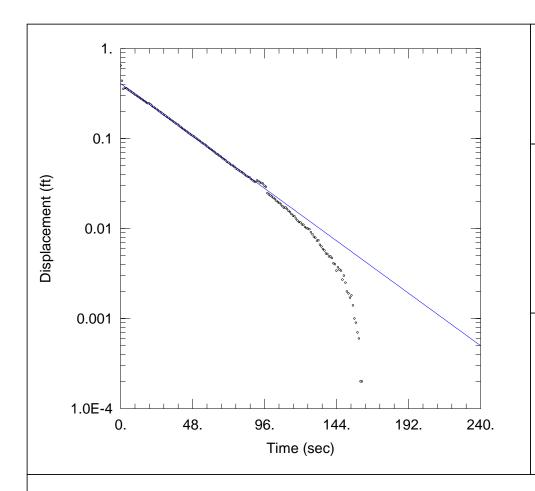
WELL DATA (UFMW-03D)

Static Water Column Height: 21.23 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 21.23 ft Casing Radius: 0.083 ft

Initial Displacement: 0.6606 ft



UFMW-03I SLUG IN

Data Set: \...\UFMW_03I_slugin_1.aqt

Date: 10/25/17

Time: 10:48:22

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03I Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.906 ft/day

y0 = 0.409 ft

AQUIFER DATA

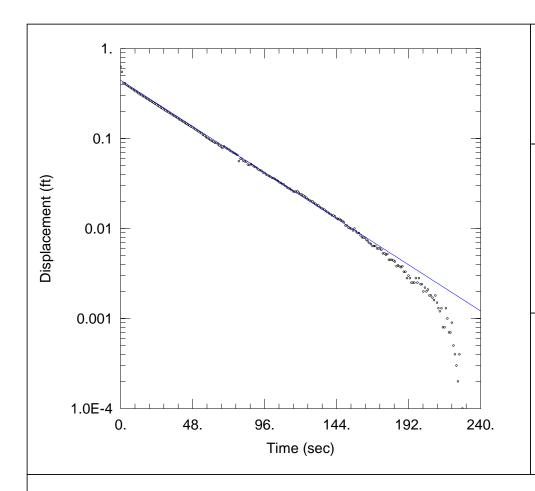
Saturated Thickness: 10. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-03I)

Initial Displacement: 0.6461 ft Static Water Column Height: 11.25 ft

Screen Length: 10. ft Total Well Penetration Depth: 11.25 ft Casing Radius: 0.083 ft Well Radius: 0.5 ft



UFMW-03I SLUG OUT

Data Set: \...\UFMW 03I slugout 1.aqt

Date: 10/25/17 Time: 10:48:35

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-03I Test Date: 10/6/2017

SOLUTION

Aguifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.678 ft/day

y0 = 0.4461 ft

AQUIFER DATA

Saturated Thickness: 10. ft

Anisotropy Ratio (Kz/Kr): 0.1

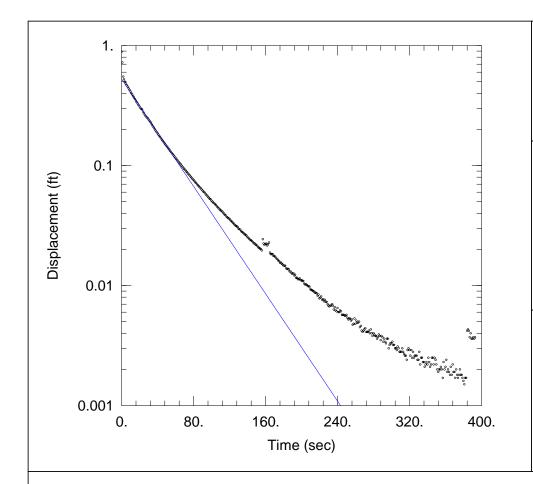
WELL DATA (UFMW-03I)

Static Water Column Height: 11.25 ft

Screen Length: 10. ft Well Radius: 0.5 ft

Total Well Penetration Depth: 11.25 ft Casing Radius: 0.083 ft

Initial Displacement: 0.6268 ft



UFMW-04D SLUG IN

Data Set: \...\UFMW_04D_slugin_1.aqt

Date: 10/25/17 Time: 10:48:47

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04D
Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 5.237 ft/dayy0 = 0.5271 ft

AQUIFER DATA

Saturated Thickness: 8. ft

Initial Displacement: 0.8879 ft

Casing Radius: 0.083 ft

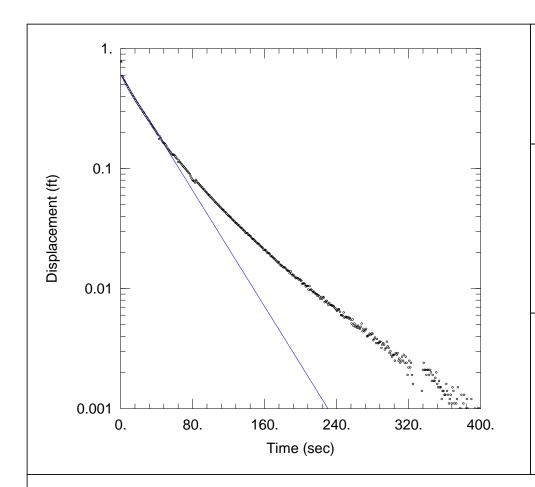
Total Well Penetration Depth: 19.35 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04D)

Static Water Column Height: 19.35 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-04D SLUG OUT

Data Set: \...\UFMW_04D_slugout_1.aqt

Date: 10/25/17 Time: 10:48:57

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04D
Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 5.658 ft/dayy0 = 0.6099 ft

AQUIFER DATA

Saturated Thickness: 8. ft

Anisotropy Ratio (Kz/Kr): 0.1

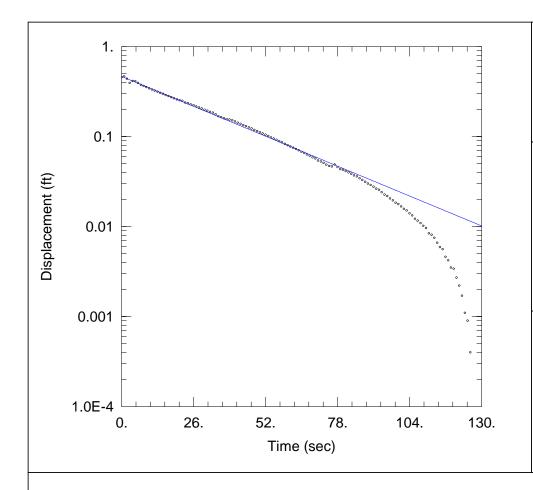
WELL DATA (UFMW-04D)

Static Water Column Height: 19.35 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 19.35 ft Casing Radius: 0.083 ft

Initial Displacement: 0.7861 ft



UFMW-04I SLUG IN

Data Set: \...\UFMW_04I_slugin_1.aqt

Date: 10/25/17

Time: 10:49:11

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-04I Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 5.253 ft/day

y0 = 0.4658 ft

AQUIFER DATA

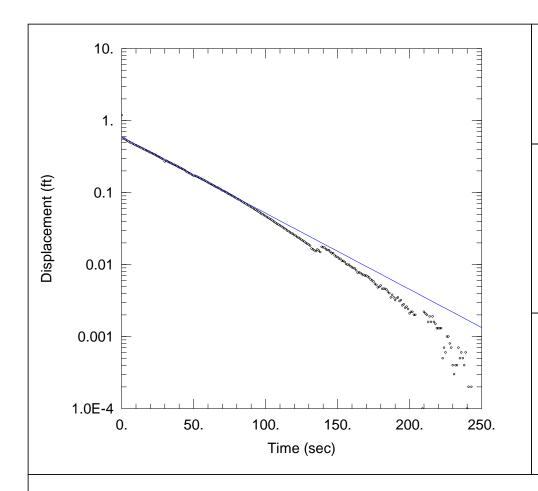
Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04I)

Initial Displacement: 0.4568 ft Static Water Column Height: 9.39 ft

Total Well Penetration Depth: 9.39 ft Screen Length: 5. ft Casing Radius: 0.083 ft Well Radius: 0.5 ft



UFMW-04I SLUG OUT

Data Set: \...\UFMW_04I_slugout_1.aqt

Date: 10/25/17 Time: 10:49:21

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-04I
Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.352 ft/dayy0 = 0.5918 ft

AQUIFER DATA

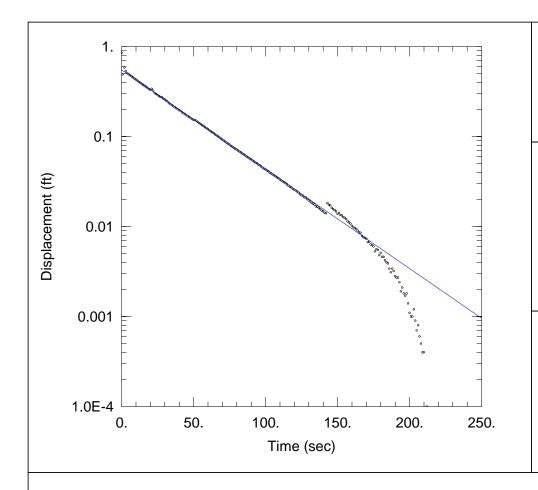
Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-04I)

Initial Displacement: 1.189 ft
Total Well Penetration Depth: 9.39 ft
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-05D SLUG IN

Data Set: \...\UFMW_05D_slugin_1.aqt

Date: <u>10/25/17</u> Time: <u>10:49:34</u>

PROJECT INFORMATION

Company: <u>Tetra Tech</u>

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 5.24 ft/dayy0 = 0.5516 ft

AQUIFER DATA

Saturated Thickness: 7.5 ft Anisotropy Ratio (Kz/Kr): 0.1

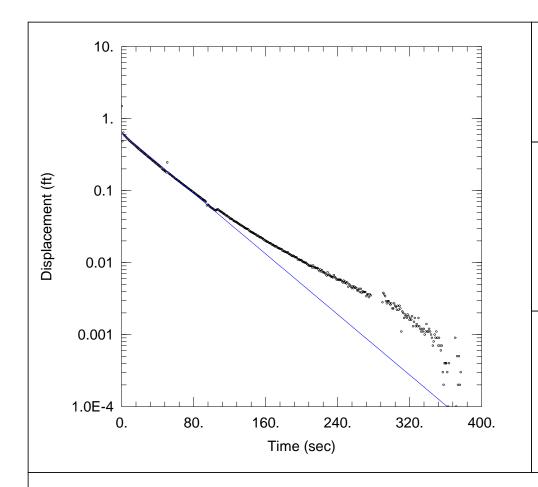
WELL DATA (UFMW-05D)

Static Water Column Height: 21.07 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 0.8559 ft

Total Well Penetration Depth: 21.07 ft



UFMW-05D SLUG OUT

Data Set: \...\UFMW_05D_slugout_1.aqt

Date: 10/25/17

Time: 10:49:44

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05D
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

 $K = \frac{4.988}{2.225}$ ft/day

y0 = 0.635 ft

AQUIFER DATA

Saturated Thickness: 7.5 ft

Anisotropy Ratio (Kz/Kr): 0.1

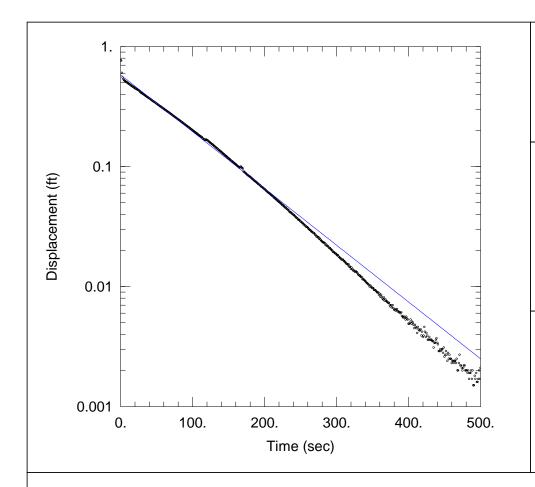
WELL DATA (UFMW-05D)

Static Water Column Height: 21.07 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 21.07 ft Casing Radius: 0.083 ft

Initial Displacement: 1.484 ft



UFMW-05I SLUG IN

Data Set: \...\UFMW_05I_slugin_1.aqt

Date: 10/25/17

Time: 10:49:57

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05I
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.006 ft/dayy0 = 0.5817 ft

AQUIFER DATA

Saturated Thickness: 7.5 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-05I)

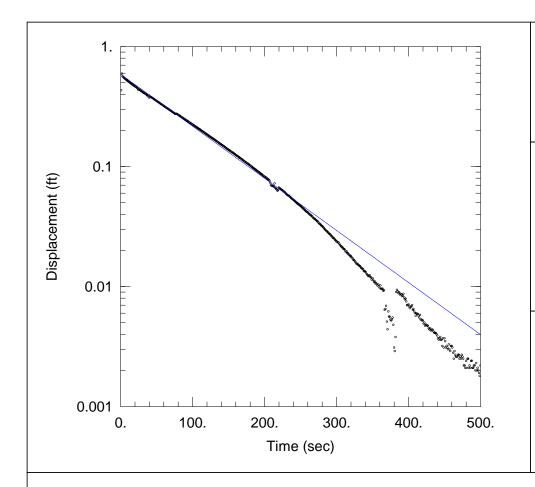
Initial Displacement: <u>0.7705</u> ft

Total Well Penetration Depth: 10.97 ft

Casing Radius: <u>0.083</u> ft

Static Water Column Height: 10.97 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.5</u> ft



UFMW-05I SLUG OUT

Data Set: \...\UFMW_05I_slugout_1.aqt

Date: <u>10/25/17</u> Time: <u>10:50:09</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05I
Test Date: 10/6/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.84 ft/dayy0 = 0.5894 ft

AQUIFER DATA

Saturated Thickness: 7.5 ft Anisotropy Ratio (Kz/Kr): 0.1

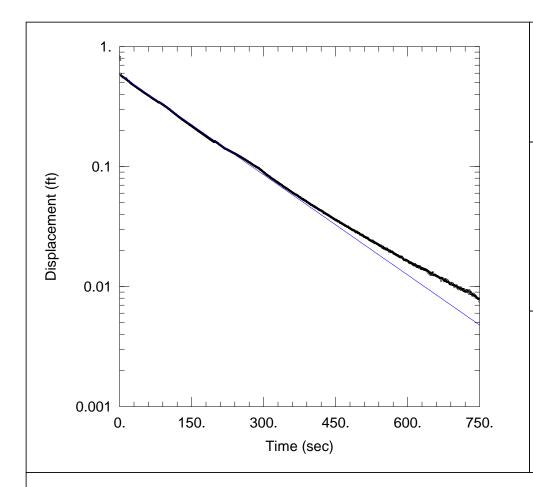
WELL DATA (UFMW-05I)

Static Water Column Height: 10.97 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Initial Displacement: 1.102 ft

Total Well Penetration Depth: 10.97 ft



UFMW-06D SLUG IN

Data Set: \...\UFMW_06D_slugin_1.aqt

Date: <u>10/25/17</u> Time: <u>10:50:21</u>

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.9189 ft/day

y0 = 0.5849 ft

AQUIFER DATA

Saturated Thickness: 4. ft

Initial Displacement: 0.8207 ft

Casing Radius: 0.083 ft

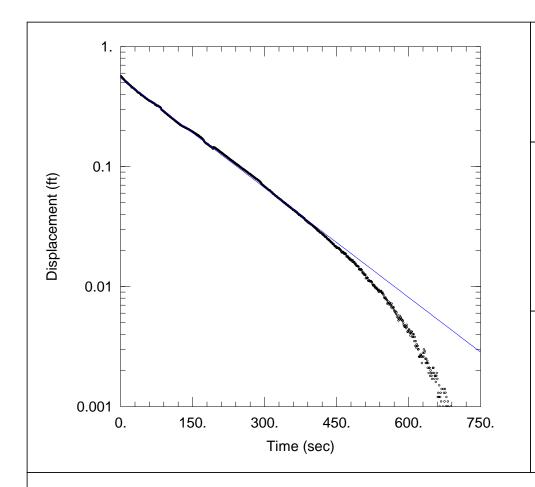
Total Well Penetration Depth: 23.15 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-06D)

Static Water Column Height: 23.15 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft



UFMW-06D SLUG OUT

Data Set: \...\UFMW_06D_slugout_1.aqt

Date: 10/25/17

Time: 10:50:31

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06D
Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.006 ft/dayy0 = 0.5474 ft

AQUIFER DATA

Saturated Thickness: 4. ft

Anisotropy Ratio (Kz/Kr): 0.1

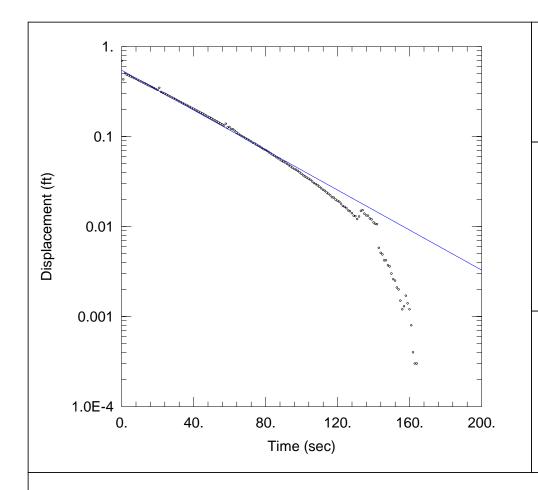
WELL DATA (UFMW-06D)

Static Water Column Height: 23.15 ft

Screen Length: <u>5.</u> ft Well Radius: 0.5 ft

Total Well Penetration Depth: 23.15 ft Casing Radius: 0.083 ft

Initial Displacement: 0.5672 ft



UFMW-06I SLUG IN

Data Set: \...\UFMW_06I_slugin_1.aqt

Date: 10/25/17

Time: 10:50:45

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-06I Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 5.062 ft/day

y0 = 0.5478 ft

AQUIFER DATA

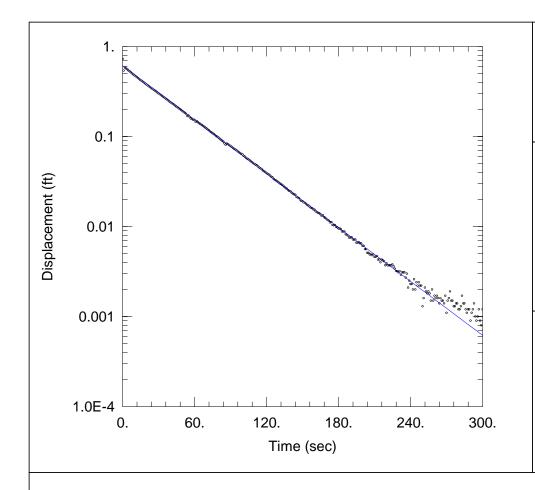
Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFMW-06I)

Initial Displacement: 0.6944 ft Static Water Column Height: 16.43 ft Total Well Penetration Depth: 16.43 ft

Screen Length: 5. ft Well Radius: 0.5 ft



UFMW-06I SLUG OUT

Data Set: \...\UFMW_06I_slugout_1.aqt

Date: 10/25/17 Time: 10:50:54

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFMW-06I Test Date: 10/5/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 4.549 ft/dayy0 = 0.6124 ft

AQUIFER DATA

Saturated Thickness: 6. ft

Anisotropy Ratio (Kz/Kr): 0.1

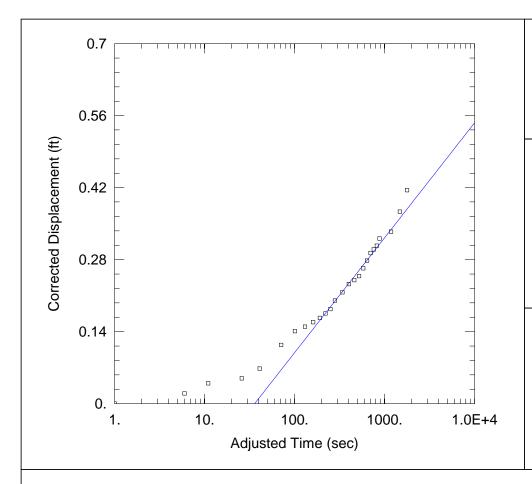
WELL DATA (UFMW-06I)

Static Water Column Height: 16.43 ft

Screen Length: 5. ft Well Radius: 0.5 ft

Initial Displacement: 0.7275 ft

Total Well Penetration Depth: 16.43 ft



PUMPING TEST FOR UFMW-05S (0.5 L/MIN)

Data Set: \...\UFMW-05S 0.5.aqt

Date: 10/26/17 Time: 08:41:46

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-05S
Test Date: 10/10/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Cooper-Jacob

 $T = 20.52 \text{ ft}^2/\text{day}$ S = 0.3081

AQUIFER DATA

Saturated Thickness: 1.22 ft Anisotropy Ratio (Kz/Kr): 0.1

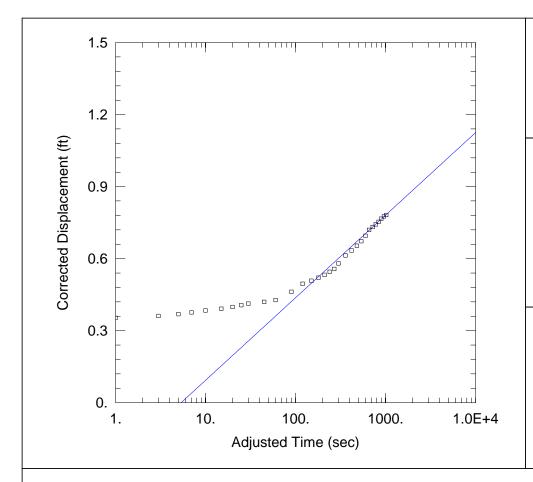
WELL DATA

i diliping vvens				
Well Name	X (ft)	Y (ft)		
UFMW-05S	0	0		

Pumping Walls

Well Name	X (ft)	Y (ft)
□ UFMW-05S	0	0

Observation Wells



PUMPING TEST FOR UFMW-06S

Data Set: \...\UFMW-06S.aqt

Date: 10/26/17

Time: 08:47:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFMW-06S
Test Date: 10/10/2017

SOLUTION

Aquifer Model: <u>Unconfined</u> Solution Method: Cooper-Jacob

 $T = 26.67 \text{ ft}^2/\text{day}$ S = 0.01489

AQUIFER DATA

Saturated Thickness: 1.71 ft

Anisotropy Ratio (Kz/Kr): 0.1

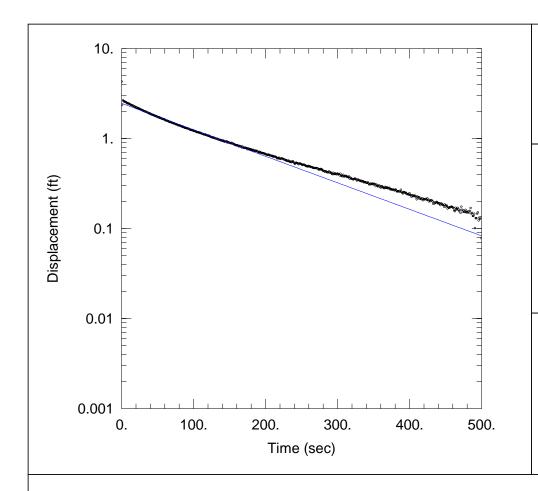
WELL DATA

Pumping wells					
Well Name	X (ft)	Y (ft)			
UFMW-06S	0	0			

D. \ \ / - | | -

Well Name	X (ft)	Y (ft)
□ UFMW-06S	0	0

Observation Wells



UFIW-01I SLUG IN 1

Data Set: \...\UFIW_01I_slugin_1.aqt

Time: 14:01:46 Date: 11/02/17

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 11/02/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.432 ft/day

y0 = 2.466 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

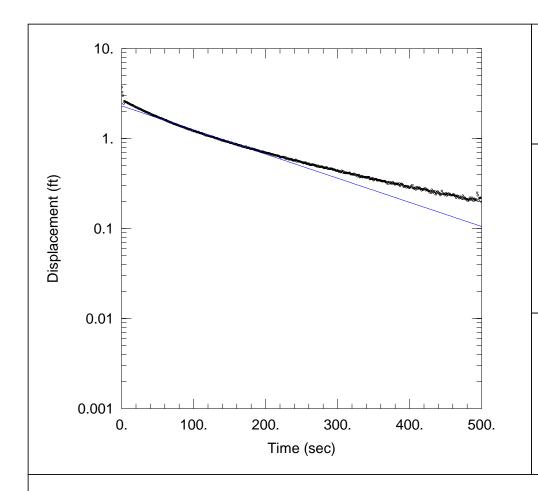
WELL DATA (UFIW-01I)

Static Water Column Height: 8.92 ft

Screen Length: 5. ft Well Radius: 0.25 ft

Total Well Penetration Depth: 8.92 ft Casing Radius: 0.083 ft

Initial Displacement: 4.291 ft



UFIW-01I SLUG IN 2

Data Set: \...\UFIW_01I_slugin_2.aqt

Date: 11/02/17 Time: 14:02:00

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-01I
Test Date: 11/02/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.303 ft/dayy0 = 2.307 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

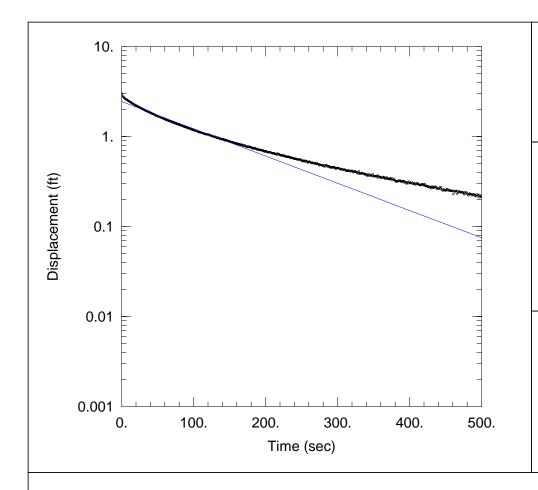
WELL DATA (UFIW-01I)

Static Water Column Height: 8.92 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.25</u> ft

Initial Displacement: 3.708 ft

Total Well Penetration Depth: 8.92 ft



UFIW-01I SLUG OUT 1

Data Set: \...\UFIW_01I_slugout_1.aqt

Date: 11/02/17 Time: 14:02:18

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV Test Well: UFIW-01I Test Date: 11/02/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.472 ft/day

y0 = 2.452 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

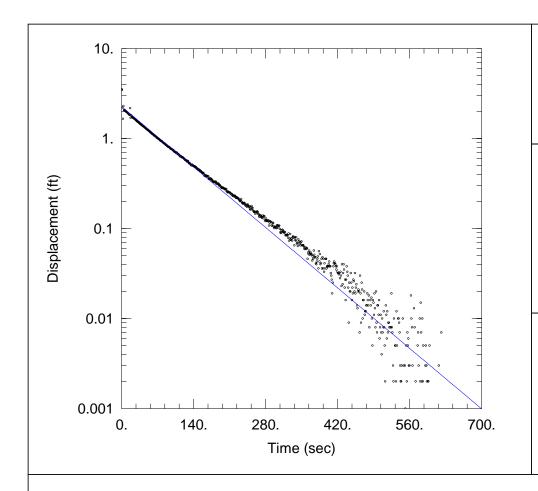
WELL DATA (UFIW-01I)

Static Water Column Height: 8.92 ft

Screen Length: 5. ft Well Radius: 0.25 ft

Initial Displacement: 3.012 ft

Total Well Penetration Depth: 8.92 ft



UFIW-04I SLUG IN 1

Data Set: \...\UFIW_04I_slugin_1.aqt

Date: 11/02/17 Time: 14:04:00

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.215 ft/dayy0 = 2.269 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Initial Displacement: 3.525 ft

Casing Radius: 0.083 ft

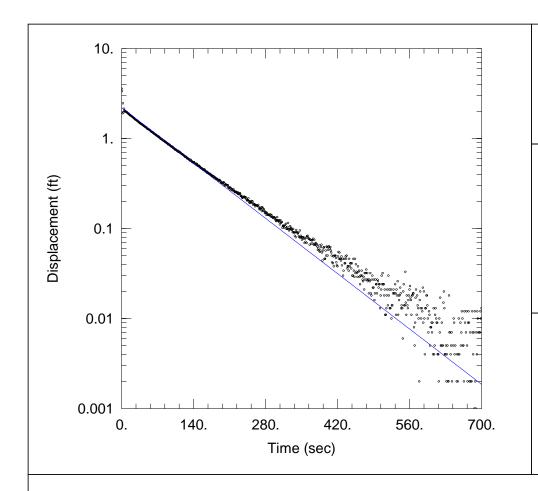
Total Well Penetration Depth: 9.61 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04I)

Static Water Column Height: 9.61 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.33</u> ft



UFIW-04I SLUG IN 2

Data Set: \...\UFIW_04I_slugin_2.aqt

Date: 11/02/17

Time: 14:04:13

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 2.028 ft/day

 $y0 = \overline{2.207}$ ft

AQUIFER DATA

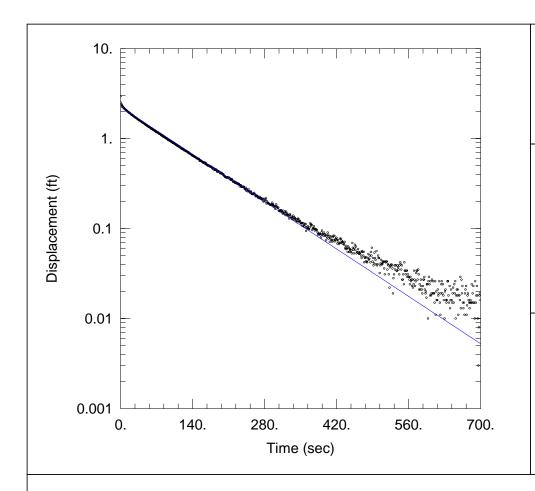
Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-04I)

Initial Displacement: 3.569 ft
Total Well Penetration Depth: 9.61 ft
Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-04I SLUG OUT 1

Data Set: \...\UFIW_04I_slugout_1.aqt

Date: 11/02/17

Time: 14:04:27

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-04I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 1.736 ft/day

y0 = 2.255 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

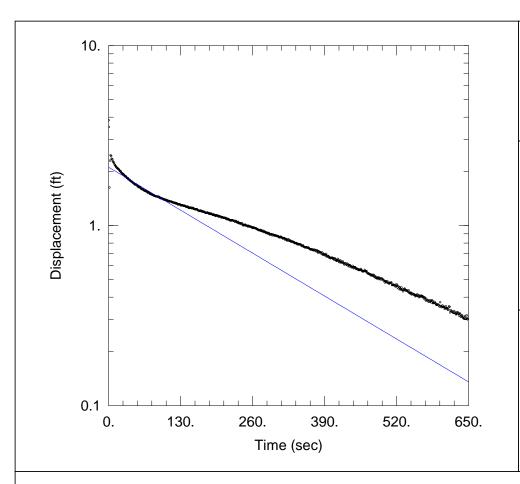
WELL DATA (UFIW-04I)

Initial Displacement: 2.95 ft

Total Well Penetration Depth: 9.61 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft



UFIW-05I SLUG IN 1

Data Set: \...\UFIW_05I_slugin_1.aqt

Date: 11/02/17 Time: 15:07:01

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.8686 ft/day

y0 = 2.11 ft

AQUIFER DATA

Saturated Thickness: 6.5 ft Anisotropy Ratio (Kz/Kr): 0.1

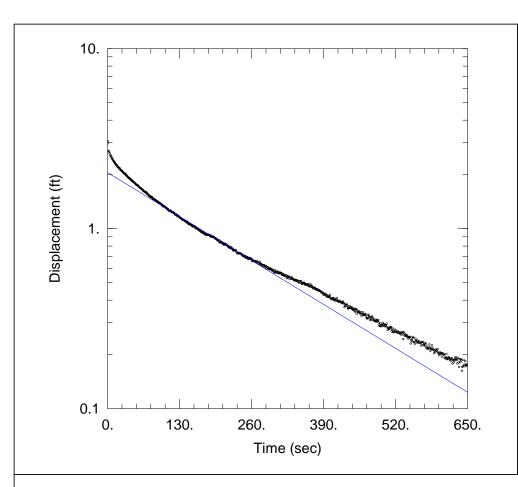
WELL DATA (UFIW-05I)

Static Water Column Height: 11.04 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.839 ft

Total Well Penetration Depth: 11.04 ft



UFIW-05I SLUG OUT 1

Data Set: \...\UFIW_05I_slugout_1.aqt

Date: 11/02/17 Time: 14:15:25

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-05I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.8891 ft/day

y0 = 2.048 ft

AQUIFER DATA

Saturated Thickness: $\underline{6.5}$ ft Anisotropy Ratio (Kz/Kr): $\underline{0.1}$

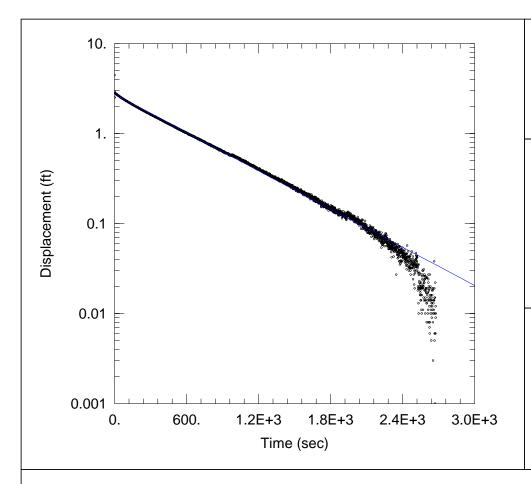
WELL DATA (UFIW-05I)

Static Water Column Height: 11.04 ft

Screen Length: <u>5.</u> ft Well Radius: 0.33 ft

Initial Displacement: 3.059 ft

Total Well Penetration Depth: 11.04 ft



UFIW-08I SLUG IN 1

Data Set: \...\UFIW_08I_slugin_1.aqt

Date: 11/02/17

Time: 14:21:52

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.3604 ft/day

y0 = 2.714 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08I)

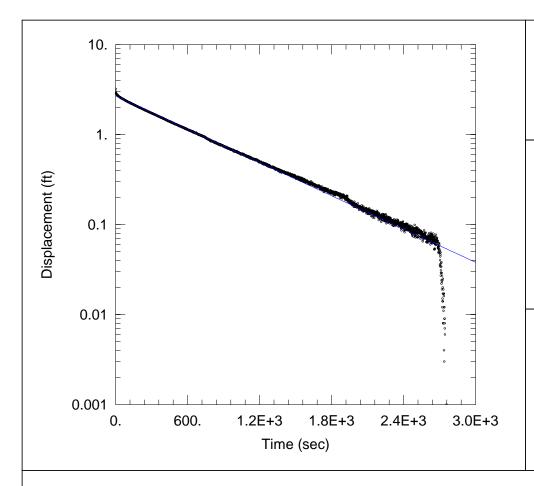
Initial Displacement: 4.457 ft

Total Well Penetration Depth: 11.82 ft

Static Water Column Height: 11.82 ft

Screen Length: 5. ft

Screen Length: <u>5.</u> ft Well Radius: 0.25 ft



UFIW-08I SLUG OUT 1

Data Set: \...\UFIW_08I_slugout_1.aqt

Date: 11/02/17 Time: 14:21:27

PROJECT INFORMATION

Company: Tetra Tech

Client: NERT

Location: Henderson, NV
Test Well: UFIW-08I
Test Date: 11/2/2017

SOLUTION

Aquifer Model: <u>Confined</u> Solution Method: Bouwer-Rice

K = 0.3143 ft/dayy0 = 2.688 ft

AQUIFER DATA

Saturated Thickness: 7. ft

Initial Displacement: 3.209 ft

Casing Radius: 0.083 ft

Total Well Penetration Depth: 11.82 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (UFIW-08I)

Static Water Column Height: 11.82 ft

Screen Length: <u>5.</u> ft Well Radius: <u>0.25</u> ft

Appendix D Injection Logs



REMEDIATION FIELD SERVICES REPORT

Nevada Environmental Response Trust Site In-Situ Chromium Treatability Study 510 South 4th Street Henderson, Nevada 89015

Date:

May 17, 2017 Rev1

Project Number:

304-17-1049

Prepared For:

Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Prepared by:

Cascade Technical Services 1225 East McFadden Avenue Santa Ana, California 92705



May 17, 2017 Rev1 Project No. 304-17-1049

Mr. Carl Lenker Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Subject: Remediation Field Services Report

Nevada Environmental Response Trust Site

In-Situ Chromium Treatability Study

510 South 4th Street

Henderson, Nevada 89015

Dear Mr. Lenker

In accordance with your request and authorization, Cascade Technical Services (Cascade) has performed remediation field services for the subject site. The field services were performed in general accordance with Cascade's proposal dated April 10, 2017.

Cascade appreciates the opportunity to provide our services to you. If you have any questions or comments regarding this report, please contact the undersigned at your convenience.

Respectfully submitted, Cascade Technical Services

Michael Gerber

Operations Manager

Distribution: (1) Addressee (via e-mail)

JP/MG

Table of Contents

1	Intro	duction	. 1
2	Rem	nediation Approach	. 1
		ect Activities	
	_	Pre-Mobilization Activities	
		Onsite Activities	
		Site Restoration	
		tations	 1

AppendicesAppendix A – Injection Summary and Logs



1 INTRODUCTION

Tetra Tech, Inc. (client), subcontracted Cascade Technical Services (Cascade) to perform remediation field services at the subject site located at 510 South 4th Street, Henderson, Nevada. Field services were conducted in general accordance with Cascade's proposal dated April 10, 2017.

2 REMEDIATION APPROACH

An emulsified vegetable oil (EOS_{PRO}) solution mixed with granular sugar, fructose solution, sodium sulfite, phosphates (Aquapure®) and water was mixed onsite at varying concentrations (see injection logs for details) on a custom build injection platform. The solution was pumped into three 2-inch onsite injection wells screened between 20 and 25 and three 2-inch wells screened between 35 and 50 feet belowground surface (bgs).

3 PROJECT ACTIVITIES

The following sections describe the field activities conducted at the site. The activities were conducted between April 17 and 21, 2017.

3.1 Pre-Mobilization Activities

A site-specific health and safety plan was prepared to address worker and general public safety.

3.2 ONSITE ACTIVITIES

On April 17, 2017, Cascade mobilized a custom-built injection platform to the site. Prior to the commencement of field activities, a tailgate safety meeting was performed. The safety meeting was followed by a site walk to review the injection well locations. The injection platform was placed inside a containment berm located within an open field. Spill kits and portable vacuums were placed within the work area for immediate deployment. Injection material transportation and handling were coordinated by the client with the exception of the fructose solution which was transported by Cascade.

The scope of work performed by Cascade included a 25 gallon water injection test performed at injection well CTIW-02D. The injection test was done to check for leaks throughout the injection system including the hose fittings and connections. Approximately 8,459 gallons of the solution was injected into the six onsite injection wells. The three shallow wells (CTIW-01S, CTIW-02S and CTIW-03S) received approximately 950 gallons of the solution and the three deep wells (CTIW-01D, CTIW-02D and CTIW-03D) received between 1,700 and 1,900 gallons of the solution (see injection logs for details). Throughout the injection activities, the injection lines were flushed with water at various quantities (see injection logs for specific quantities by well). Total volume injected into the six onsite injection wells was approximately 13,817 gallons (8,459 gallons of the solution and 5,358 gallons of test/flush water).

Remediation activities were successfully completed on April 21, 2017.

3.3 SITE RESTORATION

Investigation-derived waste was not generated during remediation activities at the site. Other waste (i.e. personal protective equipment, packaging materials, etc.) was collected in large trash bags and disposed as municipal solid waste.

4 LIMITATIONS

The implementation of the scope of work was performed in accordance with the clients design specification as described above (Section 2) and supporting injection logs (Appendix A). Cascade bears no responsibility for remediation results or impact to existing conditions.



APPENDIX A

Injection Summary and Logs



PROJECT SUMMARY

PROJECT NAME/NUMBER: TETRA TECH HENDERSON NV/30417-1049

							% S	olution				Test/Flush	
Day	Date	On-site Time	Off-site Time	Locations Completed	EOS (Gallons)	Sugar (Pounds)	Juice (Gallons)	Sodium Sulfite (Pounds)	Aquapure (Gallons)	Water (Gallons)	% Solution Injected (Gallons)	Water Injected (Gallons)	Total Injected (Gallons)
Monday	4/17/2017	1:00 PM	6:00 PM	0	0	0	0	0	0	0	0	0	0
Tuesday	4/18/2017	7:00 AM	5:30 PM	0	324	1,225	0	1	9	1,307	1,659	75	1,734
Wednesday	4/19/2017	7:00 AM	5:15 PM	0	276	1,278	2,217	2	21	620	3,000	75	3,075
Thursday	4/20/2017	6:30 AM	6:30 PM	0	0	0	3,800	26	0	0	3,800	350	4,150
Friday	4/21/2017	6:30 AM	4:30 PM	6	0	0	0	26	0	0	0	4,858	4,858
						•							
			TOTALS	6	600	2,503	6,017	55	30	1,927	8,459	5,358	13,817



INJECTION FIELD LOGS

PROJECT NAME/NUMBER: TETRA TECH HENDERSON NV/30417-1049

											% Sol	ution	1			Test/Flush	
						Initial	Sustained	Average				Sodium			% Solution	Water	Total
		Start	End	Injecti	ion	Pressure	Pressure	Flow Rate	EOS	Sugar	Juice	Sulfite	Aquapure	Water	Injected	Injected	Injected
Location ID	Start Date	Time	Time	Interv	/al	(PSI)	(PSI)	(GPM)	(Gallons)	(Pounds)	(Gallons)	(Pounds)	(Gallons)	Gallons	(Gallons)	(Gallons)	(Gallons)
	4/18/2017	12:30 PM	2:33 PM			0	0	1.5	36	150	0	0.1	1	144	180		180
	4/19/2017	7:41 AM	9:31 AM			0	20	1.8	0	150	0	0.1	1	200	200		200
	4/19/2017	11:16 AM	12:06 PM			7	7	2.0	20	0	80	0.1	2	0	100		100
	4/19/2017	2:19 PM	3:17 PM			0	0	2.3	0	132	118	0.1	0	0	132		132
CTIW-01S	4/20/2017	1:54 PM	2:17 PM	20 to	25	3	3	3.1	0	0	0	0.0	0	0	0	66	66
	4/20/2017	2:20 PM	4:27 PM			0	0	2.6	0	0	334	3.0	0	0	334	25	359
	4/21/2017	9:41 AM	9:55 AM			5	5	3.6	0	0	0	1.0	0	0	0	50	50
	4/21/2017	10:18 AM	11:05 AM			5	5	2.4	0	0	0	1.0	0	0	0	115	115
	4/21/2017	11:19 AM	2:32 PM			0	0	2.7	0	0	0	1.0	0	0	0	526	526
								TOTALS	56	432	532	6.4	4	344	946	782	1,728
	4/18/2017	10:39 AM	12:13 PM			0	5	1.9	36	150	0	0.1	1	144	180		180
	4/18/2017	2:43 PM	3:47 PM			7	7	3.3	37	0	0	0.1	1	150	187	25	212
	4/19/2017	9:53 AM	11:01 AM			8	8	2.9	40	150	160	0.1	1	0	200		200
	4/19/2017	12:23 PM	2:15 PM			0	2	1.5	31	17	134	0.2	2	0	166		166
	4/19/2017	3:29 PM	4:31 PM			0	0	3.2	0	33	179	0.1	0	0	200	25	225
CTIW-01D	4/20/2017	8:34 AM	11:18 AM	35 to	50	3	7	2.0	0	0	333	0.2	0	0	333		333
	4/20/2017	11:33 AM	1:12 PM			3	3	2.0	0	0	200	0.2	0	0	200		200
	4/20/2017	4:42 PM	6:02 PM			5	5	3.3	0	0	266	5.0	0	0	266	25	291
	4/21/2017	7:05 AM	8:40 AM			4	10	1.8	0	0	0	1.0	0	0	0	167	167
	4/21/2017	8:48 AM	10:17 AM			8	8	1.7	0	0	0	1.0	0	0	0	152	152
	4/21/2017	11:19 AM	3:10 PM			0	0	1.4	0	0	0	1.0	0	0	0	333	333
								TOTALS	144	350	1,272	9.0	5	294	1,732	727	2,459
	4/18/2017	9:46 AM	12:17 PM			0	5	1.3	38	150	0	0.1	1	152	190		190
	4/19/2017	7:44 AM	9:38 AM			0	0	1.8	0	150	200	0.1	2	200	200		200
	4/19/2017	11:14 AM	12:11 PM			5	5	1.8	20	80	80	0.1	2	80	100		100
	4/19/2017	2:19 PM	3:05 PM			7	7	2.9	0	132	119	0.1	0	0	132		132
CTIW-02S	4/20/2017	1:54 PM	2:19 PM	20 to	25	0	0	3.2	0	0	0	0.0	0	0	0	67	67
	4/20/2017	2:20 PM	4:35 PM			0	3	2.5	0	0	333	3.0	0	0	333	25	358
	4/21/2017	9:26 AM	9:56 AM			5	5	1.7	0	0	0	1.0	0	0	0	50	50
	4/21/2017	10:18 AM	11:05 AM			7	7	1.2	0	0	0	2.0	0	0	0	56	56
	4/21/2017	11:19 AM	2:46 PM			7	7	3.4	0	0	0	1.0	0	0	0	712	712
								TOTALS	58	512	732	7.4	5	432	955	910	1,865



INJECTION FIELD LOGS

PROJECT NAME/NUMBER: TETRA TECH HENDERSON NV/30417-1049

											% Sol	ution					
						Initial	Sustained	Average				Sodium			% Solution	Test/Flush Water	Total
		Start	End	Injec	tion	Pressure	Pressure	Flow Rate	EOS	Sugar	Juice	Sulfite	Aquapure	Water	Injected	Injected	Injected
Location ID	Start Date	Time	Time	Inte	val	(PSI)	(PSI)	(GPM)	(Gallons)	(Pounds)	(Gallons)	(Pounds)	(Gallons)	Gallons	(Gallons)	(Gallons)	(Gallons)
	4/18/2017	12:28 PM	4:43 PM			0	5	1.6	73	325	0	0.2	2	299	374	25	399
	4/19/2017	9:51 AM	11:01 AM			0	0	2.9	40	0	160	0.1	1	0	200		200
	4/19/2017	12:22 PM	2:10 PM			0	6	1.5	31	17	134	0.2	2	0	167		167
	4/19/2017	3:28 PM	4:40 PM			0	0	2.8	0	33	180	0.1	0	0	200	25	225
CTIW-02D	4/20/2017	8:36 AM	11:21 AM	35 to	50	0	8	2.0	0	0	334	1.0	0	0	334		334
025	4/20/2017	11:33 AM	1:31 PM		, 50	5	5	3.4	0	0	400	1.0	0	0	400		400
	4/20/2017	4:42 PM	6:02 PM			5	5	3.3	0	0	266	5.0	0	0	266	25	291
	4/21/2017	7:05 AM	8:45 AM			9	9	1.7	0	0	0	2.0	0	0	0	165	165
	4/21/2017	8:48 AM	10:16 AM			6	8	1.8	0	0	0	1.0	0	0	0	154	154
	4/21/2017	11:19 AM	3:10 PM			6	6	2.4	0	0	0	1.0	0	0	0	564	564
								TOTALS	144	375	1,474	11.6	5	299	1,941	958	2,899
		1					1			1	1	1	1			1	
	4/18/2017	12:26 PM	2:30 PM			0	0	1.5	34	150	0	0.1	1	124	180		180
	4/19/2017	7:45 AM	9:03 AM			0	0	2.6	0	200	0	0.1	2	140	200		200
	4/19/2017	11:13 AM	12:15 PM			0	0	1.6	20	0	80	0.1	2	0	100		100
	4/19/2017	2:19 PM	3:21 PM			3	3	2.2	0	134	120	0.1	0	0	134		134
CTIW-03S	4/20/2017	1:54 PM	2:15 PM	20 to	25	0	0	3.0	0	0	0	0.0	0	0	0	67	67
	4/20/2017	2:20 PM	4:04 PM			0	4	3.2	0	0	334	2.0	0	0	334	25	359
	4/21/2017	9:06 AM	9:55 AM			18	12	1.8	0	0	0	2.0	0	0	0	90	90
	4/21/2017	10:18 AM	11:06 AM			10	10	2.2	0	0	0	2.0	0	0	0	105	105
	4/21/2017	11:38 AM	2:47 PM		Ш	0	0	2.9	0	0	0	2.0	0	0	0	545	545
								TOTALS	54	484	534	8.4	5	264	948	832	1,780
	4/40/2047	0.54.444	12:10 014			0	10	1 42	24	450		0.4		444	100		400
	4/18/2017	9:54 AM	12:10 PM			0	10	1.3	34	150	0	0.1	1	144	180	25	180
	4/18/2017	2:40 PM	3:31 PM			0	9	4.2	36	150	0	0.1	1	150	188	25	213
	4/19/2017	9:51 AM	10:55 AM			3	3	3.1	40	0	160	0.1	2	0	200		200
	4/19/2017	12:21 PM	2:10 PM			3	3	1.6	34	17	134	0.2	2	0	169	25	169
CTIM 025	4/19/2017	3:28 PM	4:35 PM	25 +	ا درا	0	0	3.0	0	33	180	0.1	0	0	200	25	225
CTIW-03D	4/20/2017	8:36 AM	11:21 AM	35 to	50	3	3	2.0	0	0	333	0.3	0	0	333		333
	4/20/2017	11:31 AM	1:25 PM			5	5	3.5	0	0	400	0.3	0	0	400	25	400
	4/20/2017	4:42 PM	6:02 PM			3	3	3.3	0	0	267	5.0	0	0	267	25	292
	4/21/2017	7:03 AM	8:47 AM				4	1.6	0	0	0	2.0	0	0	0	168	168
	4/21/2017	8:48 AM	10:16 AM			4	4	1.8	0	0	0	2.0	0	0	0	154	154
	4/21/2017	11:19 AM	3:10 PM		Ш	6	6	3.3	0	0	0	2.0	0	0	0	752	752
								TOTALS	143	350	1,474	12.2	6	294	1,937	1,149	3,086
								TOTALS	600	2,503	6,017	55	30	1,927	8,459	5,358	13,817





REMEDIATION FIELD SERVICES REPORT

Nevada Environmental Response Trust Site In-Situ Chromium Treatability Study 510 South 4th Street Henderson, Nevada 89015

Date:

July 12, 2017

Project Number:

304-17-1070

Prepared For:

Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Prepared by:

Cascade Technical Services 1225 East McFadden Avenue Santa Ana, California 92705 WWW.CASCADE-ENV.COM





July 12, 2017 Project No. 304-17-1070

Remediation Specialist

Mr. Carl Lenker Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Subject: Remediation Field Services Report

Nevada Environmental Response Trust Site In-Situ Chromium Treatability Study Event 2

510 South 4th Street

Henderson, Nevada 89015

Dear Mr. Lenker,

In accordance with your request and authorization, Cascade Technical Services (Cascade) has performed remediation field services for the subject site. The field services were performed in general accordance with Cascade's proposal dated April 10, 2017.

Cascade appreciates the opportunity to provide our services to you. If you have any questions or comments regarding this report, please contact the undersigned at your convenience.

Respectfully submitted, Cascade Technical Services

Michael Gerber Operations Manager

Distribution: (1) Addressee (via e-mail)

FA/MG/JP

		TABLE OF CONTENTS
1	INT	RODUCTION
2	REN	MEDIATION APPROACH
3	PRO	DJECT ACTIVITIES
	3.1	Pre-Mobilization Activities
	3.2	Onsite Activities
	3.3	Site Restoration
4	LIMI	TATIONS

<u>Appendices</u> Appendix A – Injection Summary and Logs



July 12, 2017 Project No. 304-17-1070

1 INTRODUCTION

Tetra Tech, Inc. (client), subcontracted Cascade Technical Services (Cascade) to perform remediation field services at the subject site located at 510 South 4th Street, Henderson, Nevada. Field services were conducted in general accordance with Cascade's proposal dated April 10, 2017.

2 REMEDIATION APPROACH

An emulsified vegetable oil (EOS_{PRO}) solution mixed with granular sugar, fructose solution, sodium sulfite, sodium bicarbonate, ascorbic acid, phosphates (Aquapure® and UREA/DAP) and water was mixed onsite at varying concentrations (see injection logs for details) on a custom build injection platform. The solution was pumped into six 2-inch onsite injection wells, the shallow zone screened between 20 and 25 feet belowground surface (bgs) and the deep zone screened between 35 and 50 bgs.

3 PROJECT ACTIVITIES

The following sections describe the field activities conducted at the site. The activities were conducted between June 6 and 9, 2017.

3.1 Pre-Mobilization Activities

A site-specific health and safety plan was prepared to address worker and general public safety.

3.2 ONSITE ACTIVITIES

On June 6, 2017, Cascade mobilized a custom-built injection platform to the site. Prior to the commencement of field activities, a tailgate safety meeting was performed. The safety meeting was followed by a site walk to review the injection well locations. The injection platform was placed inside a containment berm located within an open field. Spill kits and portable vacuums were placed within the work area for immediate deployment. Injection material transportation and handling were coordinated by the client with the exception of the fructose solution which was transported by Cascade.

Approximately 8,810 gallons of the solution (not including flush water) was injected into the six onsite injection wells. The three shallow wells (CTIW-01S, CTIW-02S and CTIW-03S) received approximately 737 gallons of the solution each and the three deep wells (CTIW-01D, CTIW-02D and CTIW-03D) each received approximately 2,200 gallons of the solution. Throughout the injection activities, the injection lines were flushed with water at various quantities (see injection logs for specific quantities by well). Total volume injected into the six onsite injection wells was approximately 18,451 gallons (8,810 gallons of the solution and 9,641 gallons of water).

Remediation activities were successfully completed on June 9, 2017.

3.3 SITE RESTORATION

Upon completion of injection activities, the inside of the well boxes and the surrounding area were cleared of debris and the well boxes were secured.

Investigation-derived waste was not generated during remediation activities at the site. Other waste (i.e. personal protective equipment, packaging materials, etc.) was collected in large trash bags and disposed as municipal solid waste.

4 LIMITATIONS

The implementation of the scope of work was performed in accordance with the client's design specification as described above (Section 2) and supporting injection logs (Appendix A). Cascade bears no responsibility for remediation results or impact to existing conditions.



July 12, 2017 Project No. 304-17-1070

APPENDIX A

Injection Summary and Logs



PROJECT SUMMARY

								% Solution						
						Granular	Fructose			Urea/DAP	Sodium	% Solution	Flush Water	Total
				Wells	EOS	Sugar	Solution	Ascorbic Acid	Aquapure	Solution	Bicarbonate	Injected	Injected	Injected
Day	Date	On-site Time	Off-site Time	Completed	(Gallons)	(Pounds)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Gallons)
Tuesday	6/6/2017	7:00 AM	6:00 PM	0	150	750	750	6	6	0	30	900	0	900
Wednesday	6/7/2017	7:00 AM	5:30 PM	0	350	1,750	2,915	44	29	0	114	3,300	0	3,300
Thursday	6/8/2017	7:00 AM	6:00 PM	0	0	0	4,280	0	0	220	156	4,500	0	4,500
Friday	6/9/2017	7:00 AM	3:30 PM	6	0	0	0	0	0	110	50	110	9,641	9,751
		PROJ	ECT TOTALS	6	500	2,500	7,945	50	35	320	350	8,810	9,641	18,451



INJECTION FIELD LOGS

													% Solution	า					
	Start		End		Injed	tion	Initial Pressure	Sustained Pressure	Average Flow Rate	EOS	Granular Sugar	Fructose Solution	Ascorbic Acid	Aquapure	UREA/DAP Solution	Sodium Bicarbonate	% Solution Injected	Flush Water Injected	Total Injected
Well ID	Date	Start Time	_	End Time	Inte		(PSI)	(PSI)	(GPM)	(Gallons)	(Pounds)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Gallons)
	6/7/2017	11:03 AM	6/7/2017	12:58 PM			5	5	3.0	58	292	289	2.3	2.3	0	12	350	0	350
CTIW-01S	6/8/2017	9:22 AM	6/8/2017	11:05 AM	20 to	25	2	2	3.4	0	0	350	0	0	0	15	350	0	350
CIIW-013	6/9/2017	7:32 AM	6/9/2017	7:48 AM	20 10	25	3	3	2.3	0	0	0	0	0	37	0	37	63	100
	6/9/2017	7:50 AM	6/9/2017	12:40 PM			4	3	4.7	0	0	0	0	0	0	8	0	1,350	1,350
									TOTALS	58	292	639	2.3	2.3	37	35	737	1,413	2,150
	6/7/2017	11:03 AM	6/7/2017	1:04 PM			15	10	2.9	58	292	289	2.3	2.3	0	12	350	0	350
CTIW-02S	6/8/2017	9:22 AM	6/8/2017	11:16 AM	20 to	25	5	5	3.1	0	0	350	0.0	0.0	0	15	350	0	350
C11W-023	6/9/2017	7:32 AM	6/9/2017	7:48 AM	20 10		11	11	2.3	0	0	0	0.0	0.0	37	0	37	63	100
	6/9/2017	7:50 AM	6/9/2017	12:40 PM			15	11	4.7	0	0	0	0.0	0.0	0	8	0	1,350	1,350
									TOTALS	58	292	639	2.3	2.3	37	35	737	1,413	2,150
	6/7/2017	11:03 AM	6/7/2017	1:00 PM			20	15	3.0	58	292	289	2.3	2.3	0	12	350	0	350
CTIW-03S	6/8/2017	9:22 AM	6/8/2017	11:09 AM	20 to	25	12	10	3.3	0	0	350	0.0	0.0	0	15	350	0	350
C11W-033	6/9/2017	7:32 AM	6/9/2017	7:48 AM	20 10		13	13	2.3	0	0	0	0.0	0.0	37	0	37	63	100
	6/9/2017	7:50 AM	6/9/2017	12:40 PM			12	10	4.7	0	0	0	0.0	0.0	0	9	0	1,350	1,350
									TOTALS	58	292	639	2.3	2.3	37	35	737	1,413	2,150
	6/6/2017	1:39 PM	6/6/2017	3:44 PM			8	6	2.4	50	250	248	2.0	2.0	0	10	300	0	300
	6/7/2017	1:23 PM	6/7/2017	3:12 PM			10	6	3.2	58	292	289	5.0	2.3	0	12	350	0	350
	6/7/2017	3:42 PM	6/7/2017	5:01 PM			4	4	5.1	0	0	397	7.3	3.0	0	15	400	0	400
	6/8/2017	11:16 AM	6/8/2017	11:50 AM			5	5	7.4	0	0	248	0.0	2.2	0	15	250	0	250
CTIW-01D	6/8/2017	1:16 PM	6/8/2017	1:51 PM	35 to	50	5	5	7.1	0	0	250	0.0	0.0	0	15	250	0	250
	6/8/2017	2:38 PM	6/8/2017	3:44 PM			5	5	6.1	0	0	327	0.0	0.0	73	8	400	0	400
	6/8/2017	4:59 PM	6/8/2017	5:28 PM			6	5	8.6	0	0	250	0.0	0.0	0	0	250	0	250
	6/9/2017	7:50 AM	6/9/2017	9:06 AM			5	4	5.2	0	0	0	0.0	0.0	0	8	0	400	400
	6/9/2017	10:11 AM	6/9/2017	12:57 PM		$\perp \perp$	6	4	6.6	0	0	0	0.0	0.0	0	0	0	1,100	1,100
									TOTALS	108	542	2,009	14.3	9.5	73	83	2,200	1,500	3,700



INJECTION FIELD LOGS

													% Solution	n					
	Start		End		Inje	ction	Initial Pressure	Sustained Pressure	Average Flow Rate	EOS	Granular Sugar	Fructose Solution	Ascorbic Acid	Aquapure	UREA/DAP Solution	Sodium Bicarbonate	% Solution Injected	Flush Water Injected	Total Injected
Well ID	Date	Start Time	Date	End Time	Inte	rval	(PSI)	(PSI)	(GPM)	(Gallons)	(Pounds)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Pounds)	(Gallons)	(Gallons)	(Gallons)
	6/6/2017	1:39 PM	6/6/2017	3:46 PM			7	5	2.4	50	250	248	2.0	2.0	0	10	300	0	300
	6/7/2017	1:25 PM	6/7/2017	3:01 PM			8	5	3.6	58	292	289	5.0	2.3	0	12	350	0	350
	6/7/2017	3:42 PM	6/7/2017	5:01 PM			3	3	5.1	0	0	397	7.4	3.0	0	15	400	0	400
CTIW-02D	6/8/2017	11:16 AM	6/8/2017	11:54 AM	35 t	o 50	3	3	6.6	0	0	248	0.0	2.0	0	15	250	0	250
CTIVV-02D	6/8/2017	1:16 PM	6/8/2017	1:46 PM	33 1	0 30	3	4	8.3	0	0	250	0.0	0.0	0	13	250	0	250
	6/8/2017	2:38 PM	6/8/2017	3:38 PM			3	3	6.7	0	0	327	0.0	0.0	73	8	400	0	400
	6/8/2017	4:59 PM	6/8/2017	5:33 PM			5	5	7.4	0	0	250	0.0	0.0	0	0	250	0	250
	6/9/2017	7:50 AM	6/9/2017	1:43 PM			7	4	5.6	0	0	0	0.0	0.0	0	8	0	1,950	1,950
									TOTALS	108	542	2,009	14.4	9.3	73	81	2,200	1,950	4,150
	6/6/2017	1:38 PM	6/6/2017	3:35 PM			7	5	2.6	50	250	248	2.0	2.0	0	10	300	0	300
	6/7/2017	1:25 PM	6/7/2017	3:14 PM			8	6	3.2	58	292	289	5.0	2.3	0	12	350	0	350
	6/7/2017	3:42 PM	6/7/2017	5:01 PM			5	5	5.1	0	0	397	7.4	3.0	0	15	400	0	400
CTIW-03D	6/8/2017	11:16 AM	6/8/2017	11:46 AM	35 t	o 50	7	4	8.3	0	0	248	0.0	2.0	0	15	250	0	250
CTIVV-03D	6/8/2017	1:16 PM	6/8/2017	1:48 PM	35 t	0 30	6	5	7.8	0	0	250	0.0	0.0	0	14	250	0	250
	6/8/2017	2:38 PM	6/8/2017	3:40 PM			5	5	6.5	0	0	327	0.0	0.0	73	8	400	0	400
	6/8/2017	4:59 PM	6/8/2017	5:31 PM			5	5	7.8	0	0	250	0.0	0.0	0	0	250	0	250
	6/9/2017	7:50 AM	6/9/2017	1:43 PM			5	5	5.6	0	0	0	0.0	0.0	0	8	0	1,950	1,950
									TOTALS	108	542	2,009	14.4	9.3	73	82	2,200	1,950	4,150
								PRO	JECT TOTALS	500	2,500	7,945	50	35	320	350	8,810	9,641	18,451





REMEDIATION FIELD SERVICES REPORT

Nevada Environmental Response Trust Site In-Situ Chromium Treatability Study Event 3 510 South 4th Street Henderson, Nevada 89015

Date:

September 7, 2017

Project Number:

304-17-1082

Prepared For:

Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Prepared by:

Cascade Technical Services 1225 East McFadden Avenue Santa Ana, California 92705 WWW.CASCADE-ENV.COM





September 7, 2017 Project No. 304-17-1082

Mr. Carl Lenker Tetra Tech, Inc. 17885 Von Karman Avenue, Suite 500 Irvine, California 92614

Subject: Remediation Field Services Report

Nevada Environmental Response Trust Site In-Situ Chromium Treatability Study Event 3

510 South 4th Street

Henderson, Nevada 89015

Dear Mr. Lenker,

In accordance with your request and authorization, Cascade Technical Services (Cascade) has performed remediation field services for the subject site. The field services were performed in general accordance with Cascade's proposal dated July 27, 2017.

Cascade appreciates the opportunity to provide our services to you. If you have any questions or comments regarding this report, please contact the undersigned at your convenience.

Respectfully submitted, Cascade Technical Services

Michael Gerber
Operations Manager

Distribution: (1) Addressee (via e-mail)

JP/MG

		TABLE OF CONTENTS	
1	INTF	RODUCTION	. 1
2	REM	MEDIATION APPROACH	. 1
3	PRC	DJECT ACTIVITIES	. 1
;	3.1	Pre-Mobilization Activities	. 1
;	3.2	Onsite Activities	. 1
(3.3	Site Restoration	. 1
4	LIMI	ITATIONS	1

<u>Appendices</u> Appendix A – Injection Summary and Logs



1 INTRODUCTION

Tetra Tech, Inc. (client), subcontracted Cascade Technical Services (Cascade) to perform remediation field services at the subject site located at 510 South 4th Street, Henderson, Nevada. Field services were conducted in general accordance with Cascade's proposal dated July 27, 2017.

2 REMEDIATION APPROACH

A calcium polysulfide (CPS) solution and an emulsified vegetable oil (EVO) solution was mixed onsite on a custom-built injection platform. The CPS solution was pumped into 16, 2-inch onsite injection wells and the EVO solution comprised of EOS_{PRO}, UREA/DAP, molasses, ascorbic acid, sodium bicarbonate, and water was injected into 6, 2-inch onsite wells.

3 PROJECT ACTIVITIES

The following sections describe the field activities conducted at the site. The activities were conducted between August 7 and 11, 2017.

3.1 PRE-MOBILIZATION ACTIVITIES

A site-specific health and safety plan was prepared to address worker and general public safety.

3.2 ONSITE ACTIVITIES

On August 7, 2017, Cascade mobilized a custom-built injection platform to the site. Prior to the commencement of field activities, a tailgate safety meeting was performed. The safety meeting was followed by a site walk to review the injection well locations. The injection platform was placed inside a containment berm located within an open field. Spill kits and portable vacuums were placed within the work area for immediate deployment. Injection material transportation and handling were coordinated by the client.

Approximately 600 gallons of a calcium polysulfide solution comprised of 60 gallons of CPS and 540 gallons of hydrant water was injected into 16 onsite wells (see injection logs for details). Approximately 6,450 gallons of an EVO solution comprised of EOS_{PRO}, UREA/DAP, molasses, ascorbic acid, sodium bicarbonate, and water was injected into 6 onsite wells (see injection logs for details).

Throughout the injection activities, the injection lines were flushed with water at various quantities (see injection logs for specific quantities by well). Total volume injected into the 22 onsite injection wells was approximately 20,935 gallons.

Remediation activities were successfully completed on August 11, 2017.

3.3 SITE RESTORATION

Upon completion of injection activities, the inside of the well boxes and the surrounding area were cleared of debris and the well boxes were secured.

Investigation-derived waste was not generated during remediation activities at the site. Other waste (i.e. personal protective equipment, packaging materials, etc.) was collected in large trash bags and disposed as municipal solid waste.

4 LIMITATIONS

The implementation of the scope of work was performed in accordance with the client's design specification as described above (Section 2) and supporting injection logs (Appendix A). Cascade bears no responsibility for remediation results or impact to existing conditions.



APPENDIX A

Injection Summary and Logs



PROJECT SUMMARY

PROJECT NAME/NUMBER: TETRA-TECH NERT SITE HENDERSON/304-17-1082

PROJECT TOTALS

22

60

150

									Amendment					
					Calcium					Sodium		Solution	Flush Water	Total
		On-site	Off-site	Wells	Polysulfide	EOS	Urea/DAP	Molasses	Ascorbic Acid	Bicarbonate	Water	Injected	Injected	Injected
Day	Date	Time	Time	Completed	(Gallons)	(Gallons)	(Gallons)	(Gallons)	(Pounds)	(Pounds)	(Gallons)	(Gallons)	(Gallons)	(Gallons)
Monday	8/7/2017	1:00 PM	5:30 PM	8	30	0	0	0	0	0	270	300	1,950	2,250
Tuesday	8/8/2017	7:00 AM	4:30 PM	8	30	0	0	0	0	0	270	300	1,960	2,260
Wednesday	8/9/2017	7:00 AM	5:15 PM	0	0	0	500	500	22	125	3,639	4,650	75	4,725
Thursday	8/10/2017	7:00 AM	4:15 PM	3	0	150	50	100	28	175	1,485	1,800	4,500	6,300
Friday	8/11/2017	7:00 AM	3:30 PM	3	0	0	0	0	0	0	0	0	5,400	5,400

550

600

50

300

5,664

7,050

13,885

20,935



INJECTION FIELD LOGS

										Δm	endment Sol	ution			Amendment			
					Initial	Sustained	Average	Calcium				Ascorbic	Sodium		Solution	Flush Water		
Well ID	Start Date	Start Time	End Date	End Time	Pressure (PSI)	Pressure (PSI)	Flow Rate (GPM)	Polysulfide (Gallons)	EOS (Gallons)	Urea/DAP (Gallons)	Molasses (Gallons)	Acid (Pounds)	Bicarbonate (Pounds)	Water (Gallons)	Injected (Gallons)	Injected (Gallons)	Total Injected (Gallons)	Day Lighting
UFIW-01s	8/7/2017	2:55 PM	8/7/2017	4:00 PM	10	10	4.6	5	0	0	0	0	0	45	50	250	300	
01100-013	0/7/2017	2.551111	0/7/2017	4.001101	10	10	TOTALS	5	0	0	0	0	0	45	50	250	300	
		l		T						ı		l	I				I	$\overline{}$
UFIW-02S	8/7/2017	2:55 PM	8/7/2017	4:00 PM	5	13	4.6	5	0	0	0	0	0	45	50	250	300	
		ı	1			Г	TOTALS	5	0	0	0	0	0	45	50	250	300	
UFIW-03S	8/7/2017	2:55 PM	8/7/2017	4:00 PM	7	7	4.6	5	0	0	0	0	0	45	50	250	300	
						•	TOTALS	5	0	0	0	0	0	45	50	250	300	
UFIW-04S	8/7/2017	2:55 PM	8/7/2017	2:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
							TOTALS	0	0	0	0	0	0	0	0	0	0	
UFIW-01I	8/7/2017	4:10 PM	8/7/2017	5:10 PM	1	1	5.6	3.75	0	0	0	0	0	34	38	300	338	
						•	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-02I	8/7/2017	4:10 PM	8/7/2017	5:10 PM	5	5	5.6	3.75	0	0	0	0	0	34	38	300	338	
ļI	ļ	!	!	!	ļ	Į.	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-03I	8/7/2017	4:10 PM	8/7/2017	5:10 PM	7	7	5.6	3.75	0	0	0	0	0	34	38	300	338	
		I.	I			ı	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-04I	8/7/2017	4:10 PM	8/7/2017	5:10 PM	5	5	5.6	3.75	0	0	0	0	0	34	38	300	338	
		I.	I			ı	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-05S	8/8/2017	9:00 AM	8/8/2017	10:15 AM	17	15	4.5	3.75	0	0	0	0	0	34	38	300	338	
		l	l			l	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-06S	8/8/2017	9:00 AM	8/8/2017	10:15 AM	22	18	4.5	3.75	0	0	0	0	0	34	38	300	338	
	1	I	1		<u> </u>	l .	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-07S	8/8/2017	9:00 AM	8/8/2017	10:15 AM	21	21	4.5	3.75	0	0	0	0	0	34	38	300	338	
						l .	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-08S	8/8/2017	9:00 AM	8/8/2017	10:15 AM	16	14	4.5	3.75	0	0	0	0	0	34	38	300	338	
						l .	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-05I	8/8/2017	10:25 AM	8/8/2017	10:49 AM	17	15	4.1	3.75	0	0	0	0	0	34	38	60	98	X
			-,-,				TOTALS	3.75	0	0	0	0	0	34	38	60	98	<u> </u>
UFIW-06I	8/8/2017	10:25 AM	8/8/2017	11:40 AM	15	13	4.5	3.75	0	0	0	0	0	34	38	300	338	
		<u> </u>	1			<u> </u>	TOTALS	3.75	0	0	0	0	0	34	38	300	338	
UFIW-07I	8/8/2017	10:25 AM	8/8/2017	10:56 AM	16	15	4.4	3.75	0	0	0	0	0	34	38	100	138	X
	.,.,	1	1 , -,				TOTALS	3.75	0	0	0	0	0	34	38	100	138	
UFIW-08I	8/8/2017	10:25 AM	8/8/2017	11:40 AM	12	10	4.5	3.75	0	0	0	0	0	34	38	300	338	
	2, 2, 2227		2, 2, 222				TOTALS	3.75	0	0	0	0	0	34	38	300	338	



INJECTION FIELD LOGS

										Am	endment Sol	lution			Amendment			
	Start		End		Initial Pressure	Sustained Pressure	Average Flow Rate	Calcium Polysulfide	EOS	Urea/DAP	Molasses	Ascorbic Acid	Sodium Bicarbonate	Water	Solution Injected	Flush Water Injected	Total Injected	Day
Well ID	Date	Start Time	Date	End Time	(PSI)	(PSI)	(GPM)	(Gallons)	(Gallons)	(Gallons)	(Gallons)	(Pounds)	(Pounds)	(Gallons)	(Gallons)	(Gallons)	(Gallons)	Lighting
	8/9/2017	8:22 AM	8/9/2017	4:53 PM	7	16	3.1	0	0	167	167	7	42	1,213	1,550	25	1,575	
	8/10/2017	7:40 AM	8/10/2017	9:09 AM	8	10	3.4	0	0	0	33	2	8	266	300	0	300	
CFIW-01D	8/10/2017	9:09 AM	8/10/2017	10:09 AM	9	9	2.5	0	25	0	0	2	3	124	150	0	150	
	8/10/2017	11:26 AM	8/10/2017	3:45 PM	7	7	2.9	0	0	0	0	2	0	0	0	750	750	
	8/11/2017	7:30 AM	8/11/2017	2:19 PM	13	12	4.4	0	0	0	0	0	0	0	0	1,800	1,800	
		•	•	-			TOTALS	0	25	167	200	13	53	1,603	2,000	2,575	4,575	
	8/9/2017	8:22 AM	8/9/2017	4:53 PM	8	15	3.1	0	0	167	167	7	42	1,213	1,550	25	1,575	
	8/10/2017	7:40 AM	8/10/2017	9:09 AM	13	12	3.4	0	0	0	33	2	8	266	300	0	300	
CFIW-02D	8/10/2017	9:09 AM	8/10/2017	10:09 AM	11	11	2.5	0	25	0	0	2	3	124	150	0	150	
	8/10/2017	11:26 AM	8/10/2017	3:45 PM	10	9	2.9	0	0	0	0	2	0	0	0	750	750	
	8/11/2017	7:30 AM	8/11/2017	2:19 PM	12	11	4.4	0	0	0	0	0	0	0	0	1,800	1,800	
			•				TOTALS	0	25	167	200	13	53	1,603	2,000	2,575	4,575	
	8/9/2017	8:22 AM	8/9/2017	4:53 PM	5	13	3.1	0	0	167	167	7	42	1,213	1,550	25	1,575	
	8/10/2017	7:40 AM	8/10/2017	9:09 AM	11	10	3.4	0	0	0	33	2	8	266	300	0	300	
CFIW-03D	8/10/2017	9:09 AM	8/10/2017	10:09 AM	12	11	2.5	0	25	0	0	2	3	124	150	0	150	
	8/10/2017	11:26 AM	8/10/2017	3:45 PM	11	10	2.9	0	0	0	0	2	0	0	0	750	750	
	8/11/2017	7:30 AM	8/11/2017	2:19 PM	8	10	4.4	0	0	0	0	0	0	0	0	1,800	1,800	
				<u> </u>			TOTALS	0	25	167	200	13	53	1,603	2,000	2,575	4,575	
CFIW-01S	8/10/2017	10:31 AM	8/10/2017	11:13 AM	6	5	3.6	0	25	17	0	2	33	105	150	0	150	
Crivv-013	8/10/2017	11:25 AM	8/10/2017	3:45 PM	6	6	2.9	0	0	0	0	3	14	0	0	750	750	
							TOTALS	0	25	17	0	4	47	105	150	750	900	
CFIW-02S	8/10/2017	10:31 AM	8/10/2017	11:13 AM	8	6	3.6	0	25	17	0	2	33	105	150	0	150	
Criw-023	8/10/2017	11:25 AM	8/10/2017	3:45 PM	6	5	2.9	0	0	0	0	2	14	0	0	750	750	
							TOTALS	0	25	17	0	4	47	105	150	750	900	
CFIW-03S	8/10/2017	10:31 AM	8/10/2017	11:13 AM	10	7	3.6	0	25	17	0	2	33	105	150	0	150	
5.110-055	8/10/2017	11:25 AM	8/10/2017	3:45 PM	8	7	2.9	0	0	0	0	2	14	0	0	750	750	
_				_			TOTALS	0	25	17	0	4	47	105	150	750	900	
						DDO.	JECT TOTALS	60	150	550	600	50	300	5,664	7,050	13.885	20.935	
						PRO	JECT TOTALS	00	130	330	000	30	300	3,004	7,030	13,003	20,333	



Appendix E Groundwater Monitoring Logs

Biological Reduction Study



WELL WATER LEVEL MEASUREMENT LOG

Page 1 of _

NERT, Henderson, NV Project

Task Name: In-Stu Co Treata 1, 774 Aud	Task No: MIZ	Date: 4/3/17
	Field Sampler(s): D. Keady	Recorded by: D. Kendy
Equipment Model/Type:	' Serial Number:	Last Calibration Date:

Well Identification	Describe Measuring Point	Time (hrs)	Depth to Static Water Level (ft BMP)	Well Sounding Depth (ft BMP)	Condition of Well and Well Seal
CTIW-OIS		0852	22.24	BIOTRAPINNE	L
CT+W-OID		0855	27.21	BIO TRAPNIN	
CTIW-025		09,00	77.49	24.35	
CTIW-02D		0904	27,52	49.40	
CTIW-03S		0914	72.53	24,22	
CTIW-03D		0916	22.80	49.10	
CTMW-OLS		0924	22.71	23.75	
CTMW-OID		Onli)	72,37	49.41	
(+MW-025		0929	22,47	23.67	
CTMW-02D		0931	22,72	49.14	
CTMW - 035		0935	22.36	BIOTRAP IN WE	ar .
CTMW-03D		0937	27. 43	BIOTRAP IN WE	u_
CTMW-045		0942	22.37	24,00	
CTMW-04D		0946	27.62	48.99	
				.0 , (



I OW FLOW CROLINDWATER SAMPLING LOC

Page 1 of 1

Task Namo		\$4.6-1	Front 173	CLI	In the			UUIVUV	VAIER	SAMP	LING LO)G		N N	IERT, Hender	son, NV Proje
Field Samp	lore:	DIVOR	reata Lina	13 May	Task Manag	ger: Arv	1 Ayya	Warni		Task No:	MIZ				TIW-C	
Well Depth		D. Kro			(6)					Recorded t		eadu		Date: 4 -		
Well Diame				istance AGS			Well Depth	(ft BMP): Z	3.59	Screened/0	Open Interval 1	op: 7		(ft BGS)		(ft BM
			[PID/FI	ID Readings	Beneath Inne	r Cap (ppm c				Screened/0	Open Interval E	Bottom:		(ft BGS)		(ft BM
Pump and 1 Equipment I		rype:	ED Sampl	upro;	poly tub	mg-		e Depth: 💹		(ft BGS)			(ft BMP)	MP Descripti	ion: TOC	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Equipment							Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	22.26	Time:		+	1: GW-11 Pon	J
	PURGING	MPLING	Temp. (°C)	1	pH Units)		nductivity 3/cm)	W- BQ (r	ma/L)	COLUMN TO SECURE	Potential (mV)	A THE SALE SHAPE AND ADDRESS OF THE PARTY OF	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol.
Time		READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	Purged (ml)
1443	X	27.10		7.46		9.18		201/232		166		0.7		Hilland State (Control of Control		
1448	X	26.39		7.31		9.37		1.55/2.03		170	 	1			22.30	
1453	X	25.64		7.31		9.43		1.32/2.06				0.0		 	22.30	
1458	X	25.39		7.30		9.45		1.22/207		170					27.30	
1503	X	25.3K		7.30		9,49				170		0.0			22.30	
1510	+		111ZAT			7,77		1.19/		170		0.0			7230	
1010	+		15121	0//												
	++	-					ļ									
	+	-	+	 -												
	\vdash	ļ														
	-															
\																
													1	t		
													-KI	S 4-7		
														()	17	_/
Sample ID:		0 -0	4	= 2 22	Duplicate ID:					24/22.0						
Sa	mple (Container						Material Cod		QA/QC Sam		01 00			COC Time: \5	00
	Mater	rial						Field Decont	amination:	mi giass via	ii; AG =Amber Field Filtered:	Glass; CG ≈	Clear Glass; i	PE=polyethyle	ne; O=Other (S	pecify)
Number	Cod	e Volu	me Pres	ervative	Intended A	nalysis and/o	or Method	Comments:	armidaon.		r ieiu r iliereu.	TN	COC Number	:		
								To.	מיני ונימים	n : 0.1	27, m	2/4				
In-J.	H (1 Trea	tal 7,74	Stroll	fut	2		1	10.1		or my t	?;				
		_	1 /	0,00	7 0 7			20	Me:	0.00	- mgi					
								1	70-	$() \cup ($						
INDICATOR	PAR	METERS	HAVE STABLIZ	ZED WILLEN	2.001050	ITU /C DE .	DIVIDE 15	Signature(s)	:	x Y						
± 0.1 for r	iH:	± 3% for	Specific Co	anductivi	o CONSECT	UNIVE REA	DINGS ARE	WITHIN:		(1000			
569 -	DEIOW !	огоина бипа	ice C	- Centigrade	er anu rer	GS - Groun	d Surface							nd Turbid		
BMP -	Below !	Measuring Po	oint C		of Custody	ID + Identific	ration	mg/L - milligra		min - Minute	e M	P - Measurin	g Point	Q	A - Quality Ass	urance

COC - Chain of Custody

ID - Identification

mV - milli Votts

ml - milliliter

NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

TETRATECH	ЕСН
-----------	-----

Page | of \

LOW FLOW GROUNDWATER SAMPLING LOG Task Name: In-SAU Cr Treatan 1774 Shuly Task Manager: AN Ayyas warni NERT, Henderson, NV Project Task No: MIZ Well ID: OTEN OID Field Samplers: Recorded by: D. Kendy Date: 4-6-17 Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 38,56 Screened/Open Interval Top: (ft BGS) 33.54 (ft BMP) Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) Pump and Tubing Type: QED Sample Pro; poly Whing (ft BMP) Pump Intake Depth: (ft BGS) 36.06 MP Description: TOC Equipment Decon. Method: 3 bucket onse (ft BMP) Depth to Water Before Pump Installation (ft BMP): 22.21 Time: 0800 GW Disposal: 6W-// Pond PURGING SAMPLING Temp. pН Spec Conductivity Dissolved Oxygen Redox Potential **Turbidity** Purge Depth to (°C) Cum. Vol. (dS/cm) (pH Units) READ CHAI ORP (mV) (NTU) Rate Water Purged READ CHANGE* Time READ CHANGE* READ CHANGE* CHANGE* READ CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) 0824 23,69 11.8 0.76/2.33 00 22.49 0 115 0829 180 24.63 11.8 1.27/202 104 49.9 22,49 500 100 0934 75.01 0.09/1.57 11.3-108 23.7 100 1000 0839 25.22 0.00/1.29 112 10.0 100 22,49 0844 1500 25.34 25.55 7.45 0.00/ (.32 113 6.2 100 22.41 0849 7.45 0.00/1.20 115 .7 22.49 100 X STABILITATION OPPO X 4617 Sample ID: CTIW-01D-20170406 Duplicate ID: QA/QC Samples/ID: COC Time: 0900 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrous iron: 0.00 mg/L NERT IN-STO G Treat go 17. Ty Study Sulfide: O.dl mg Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential: ± 16% for Dissolved Oxygen and Turbidity **BGS - Below Ground Surface** C - Centionade

BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

STOP

LOW FLOW GROUNDWATER SAMPLING LOG

Page \ of (

NERT, Henderson, NV Project Task Name: NERT IN-SAU CT Treaty Lity Study Task Manager: Prul Ayyaswarni Task No: MIZ Well ID: CTIW-025 Field Samplers: D. Keady Recorded by: D. Keady Date: 4-3-17 Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 23,67 Screened/Open Interval Top: (ft BGS) 17.47 (ft BMP) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: 24.47- 2435 (ft BMP) (ft BGS) Pump and Tubing Type: QED Sample Pro · polything Pump Intake Depth: 23.35 (ft BGS) (ft BMP) MP Description: Equipment Decon. Method: 3 Locket pour Depth to Water Before Pump Installation (It BMP): 22,47 GW Disposal: Gw 11 Pand Time: PURGING Temp. pН Spec Conductivity **Dissolved Oxygen** Redox Potential **Turbidity** Purge Depth to Cum. Vol. (°C) (atinU Ha) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* READ Time CHANGE* READ CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) READ CHANGE* 1323 26.72 6.51 9.17 0.60 164 170 22,54 Ø 100 1328 24,92 9.31 6,62 0.41 16 19,2 100 23,58 500 1333 24.64 6.68 9.26 0,32 159 2.1 23.50 100 000 1338 24.44 9.22 672 157 0.31 0,0 23,58 500 00 1343 9.20 0.35 156 0.0 3,58 2006 00 STOPEN 1440 24.01 9.18 0.38 159 0.0 23.55 100 2000 1445 23.98 0.36 100 0.0 156 23.5% टा 1450 23.96 9,10 0.34 153 0.2 100 23.52 3000 1510 STARILLEATION Sample ID: (TIW-025-2017-0403 Duplicate ID: QA/QC Samples/ID: **COC Time:** 510 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Malerial Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Intended Analysis and/or Method Preservative Comments: Ferrous iron: 0.07 mg/ Sultide: 0.00 mg/L In-Joh/ Jr Justo Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 mv for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity **BGS - Below Ground Surface** C - Centiorade GS - Ground Surface mg/L - milligram/Liter min - Minute

mV - milli Volts

ml - milliliter

MP - Measuring Point

NTU - Nephelometric Units

QA - Quality Assurance

QC - Quality Control

LOW FLOW GROUNDWATER SAMPLING LOG

						200				O/ 11111 Z		0		N ₁	EKI, Hender	son, NV Projec
Task Name	In-	situ cr	Tregtable	ty Study	Task Manag	er: Arul	Ayyasw	lami		Task No:	MIZ			Well ID:	TIN-0	2.D
Field Samp	lers: D). Kega	7	/ /			11			Recorded b		padu		Date: 4-		
Well Depth			/ MP D	istance AGS (,ft):		Well Depth	(ft BMP): 4	19.40	Screened/O	pen Interval T		4.40	(n HCS)		(ft BMF
Well Diame			PID/F	ID Readings /	Beneath Inner	Cap (ppm co	ge akb):			Screened/O	pen Interval B		7.40	(fLBGS)		(ft BMF
Pump and 1	ubing Ty	pe: QED	SamplePA	o; poly	Whing		Pump Intake	e Depth: 4	1.90	(ft BGS) Br	19 _		(ft BMP)	MP Descripti	ion: To c	
Equipment i			bucket ri	786	0		Depth to Wa	ater Before Pu	ımp Installatio	n (ft BMP):	22.52	Time:	825	7-	1: GWIFE	nd
	ပ္ ပ္	Т	emp.	T i	Н	Spec Co	nductivity	Dissolve	ed Oxygen	Redox	Potential	Tur	bidity		Depth to	Cum. Vol.
		3 0	(°C)	(pH	Units)	my	/cm)			THE REAL PROPERTY AND ADDRESS OF	(mV)		ITU)	Purge Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	PO (CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0845	X	21.10		6.57		124		1.76/2	b.	302		222		100	22.65	Ø
0850	X	72.01		6.96		17.3		147/1.86		272		163		105	24.65	500
0855	X	22,44		7.09		12.3	 	155/172		254		119		100	22.68	(000
0900	X	22.74		7.14		12.3	 	1.68/1.85		245		90.3		100	22.68	1500
0905	X	22.81		7.14		12.2		1.75/1.65		238		78.5		100	22.70	2000
0910	X	22.95		7.19		12.2		1.81/1.62		228		63.5			22.70	_
0915	X	23.12		7,19		12.2		1-83/1.65			/00	-	2500			
0920	X	23.14		7.20		12.2		1.18/1.60		221		56.6 400		100	22.71	7000
0925		23.24		7.20		122				211				100	22.71	3500
0930	Y	23.34					. /	193/1.67		205		42.2		100	22.71	4000
0935	X		31420	7.22		12.2		1.84/		203		38.1		100	22.71	4600
0-(5)		ONE	2140	Mov												
												4-4-	7			
		-									7E	4				
											1					
Comple ID:			2012 (1)													
	imple Co		-2017040	4	Duplicate ID:					QA/QC Sam					COC Time: 🔾	
OE.	Materia						A 12-21			0 ml glass via	al; AG =Amber	Glass; CG			ene; O=Other (Specify)
Number	Code		me Pre	servative	Intended A	nalysis and/o	or Method	Comments:	ntamination:	YN	Field Filtered:	<u> </u>	COC Number	:		
								Oomments.	Fourous :	ron = C	0.03 n	d_/L				
NE	KIj	th-57	UCH SI	ite					SULAND	٠ ٥. ٦	0.03 n	76				
								1	our race			(0				
		ļ							1	5//\						
INDICATO	- DADAI	METEROL	INVE OTABLE					Signature(s):	-			<u> </u>			
+ 0.1 for	r PARAI	METERS H	HAVE STABLE	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:						17 70		10
BGS -	Below G	Fround Surfa	Specific C	C - Centigrade	<u>tv and 191</u>	GS - Groun	e: ± 10	my for Re	dox Poter							10
BMP -	Below M	leasuring Po		COC - Chain		ID - Identific		mg/L - millig mV - milli Va		min - Minut ml - millilite		IP - Measuri ITU - Nenhe	ng Point Iometric Units	(QA - Quality As QC - Quality Co	surance
											• • •			,	40 - Mudilly Ul	2110 01

LOW FLOW GROUNDWATER SAMPLING LOG

Page ___ of ___

										MILIN		JING LU	G		N	ERT, Hender	son, NV Projec
Task Name:	NEP	47	en-difu	Cr Treatelo	MAYTIL	Task Manag	er: An	Ayya	inami		Task No:	m12_				TIW-0	100
Fleid Sampi	ers:	Ψ,	Keas	×7				11			Recorded by	y: D. Ke	ad u		Date: 4-	4-17	90
Well Depth	ft BG!	S): _		MP D	istance AGS ((ft):		Well Depth	(ft BMP): Z	4.22	Screened/O	pen Interval T	DD: L	9.22	(ft BGS)		(ít BMP
Well Diamet	er (in)): 2		PID/F	ID Readings (Beneath Inner	Cap (ppm cg	ge akb):				pen Interval B		4.22	(ft BG8) 🙎		(ft BMP
Pump and T	ubing	Турі	e: QE	D Samp					Depth: 7_3	7.7	(ft BG8) B				MP Description		(It Divi
Equipment ()econ	. Me	thod: 3	butet	nince	0	77				n (ft BMP):	22.53	Time:			: GW-11 Pa	
			-	emp.	-	Н	Spec Co	nductivity		d Oxygen					of the same of the same	1	
	I Ž	둙		(°C)		Units)		/cm)	THE RESERVE AND ADDRESS OF THE PARTY OF THE	mg/L)	1071 Oct Market 1971 111	Potential (mV)		bidity TU)	Purge	Depth to	Cum. Vol.
Time	PURGING	SAM	READ	CHANGE*	READ	CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Rate (ml/min)	Water (ft BMP)	Purged (ml)
237	1 0 1		Z3.53		7.37		11.0		2.98/27		192		172		100	7257	0
1242	X		23.74		7.29		11.0		234/252		192		58.8		100	22.57	500
1247	14		Z3.83		7. 20		1.0		2.22/194		196		21.			72.57	
	X		23.95		7.16		0.9		2.11/2.03		197				(00		1000
1257	Ż		24.03		7.6		10.9		2.16/2.05				10.7		100	22.57	1500
1302	X	\forall	24.11		7.14		10.9		2.10/20		197		6.9 4.6 3.2		00	22.57	2000
1307	X	+	24.17		7.14				7.10/201			100	22-57	7500			
13/2					7.14		10.9				197			10	100	22.57	3000
	X,	V	24.60	11 16 00	7117		0.9		2.21/		197	V	2.7	V (25)) 100	22.57	3500
1313	1315 X STABILIBATION																
		+									-			ļ			
	-																
		+													1		
		+											1-1	1-4			
		$^{+}$											14				
													X				
Sample ID:	CI	T	N-03	5-20/70	2404	Duplicate ID:	_		- <u>-</u>		QA/Q6 Sam			346		COC Time:	(315
Sa	_		ntainer					Service W.	Material Co	des: VOA = 4) ml glass via	ıl; AG =Amber	Glass; CG =	Clear Glass; I	PE=polyethyle	ene; O=Other (S	Specify)
Number	Mate		Volun	me Pre	servative	Intended A	nalysis and/o	or Mothod	-	tamination:	Y N	Field Filtered:	YN	COC Number			
	- 00	-	Total	110	SCITALITO 1	IIIICIIUCU A	naiyaia anur	i Melliod	Comments:		man.	0.02	m. l	/			
1/50	+	7	in-5	110	6.7				1 14	. C. A	11071	0.02	7/10				
LARK	,	+	11 0	TUIT	-00H	Ę			1 20	lode	$\sum_{i} O_{i}$	01 m	1/2				
										1	$\langle 1 \rangle$	1 10					
									Signature(s	s):	2						ĺ
INDICATOR	₹ PAF	RAM	ETERS H	AVE STABLE	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:	4							
± 0.1 for)Hi_	±	3% for	Specific C	onductivi	tv and Te	mperatur	e: ± 10 i	mv for Re	dox Poter			ssolved	Oxvgen a	nd Turbid	litv	
BG3 -	REIOM	w Gro	ound Surface asuring Po	ice (C - Centigrade COC - Chain o	3	GS - Groun ID - Identific	d Surface	mg/L - millig	ram/Liter	min - Minute	e N	P - Measuri	ng Point	C	QA - Quality As	
			mauring i V		JUG - CHAMI	or obstody	in - idelifili	JauUII	mV - milli Vo	MS	ml - milliliter	r N	IU - Nephel	ometric Units	C	C - Quality Co	ontrol



TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

NERT Henderson NV Project

Tank Mama	Alest	ه ما سدا	M CT	1 17-	T-1.41		4 0		875.50		4 -1 -		78 2			SUII, INV FIUJE
Field Come	LARE	In-	STO GI	eastalaling	Lask Manag	er: An	1 Ayy	aswani		Task No:	M12				TW-03	5D
Field Sampl	ers:	1 Kea	49				• •			Recorded b		ady		Date: 4 -	4-17	
Well Depth				istance AGS			Well Depth	(ft BMP): 4	9.10	Screened/C	pen Interval T	op: /34	./0	(ft BieS)		(ft BMF
Well Diamel		2			Beneath Inner		ge akb): 💹			Screened/C	pen Interval B	ottom: 44	7.10	(ft Bes)		(ft BMF
Pump and T	ubing Ty	pe: QEI	Survel	e pro:	poly ful	ik y	Pump Intake	e Depth:		(ft BGS)	41.6		(ft BMP)	MP Descripti	on: TCC	
Equipment (Decon. M	ethod:	bucke	+ nhie	1 1		Depth to Wa	ater Before Pu	mp Installation	r (ft BMP):	22.80		445		(GW-1	Prud
	ပ ပို	T	emp.	- 44	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Tue	bidity	E. September	1	
	1 3 3 3		(°C)		Units)	27 2 23 24 4 1 1 1	/cm)			TECH-1281 - ACC	(mV)	The second secon	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	TREAD?	mg/L)	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1505	X	25.50	1	7.66		13.5		3.23/	· · · · · · · · · · · · · · · · · · ·	163		28,9		1.Co	23.10	ø
1510	X	24,92		7.64		13.5		1					-	100		
	3						 	3.00/3.0		164	-	35.4		100	23.12	200
1515	12	24.64		7.65		13.3		24/30		164		36.0		100	23.13	(000
1520		24.68		7.67		13.3		247 3.02		164		35.8		100	23.14	1500
1525	X	24.60	V	7.69		17.2		2,38/3.∞		164		33.3		100	27.14	7,000
530	XX	STAG	LUZAT	ION												1
																1
										-			-			
	- -										!				ļ	
 																-/
							İ			06						/
				<u> </u>		-				1	6				/	
	\										1-6					
									j		//	5				
Sample ID:	CID	4- 035	-20170	POP	Duplicate ID:				32	QA/QC Sam	ples/ID:			40.74%	COC Time:	7.0
Sa	mple Co	ontainer				- Leille	DANIE JE	Material Co				Glass: CG :	Clear Glass	PF=nolvethule	ene; O=Other (Specify)
= = 3500	Materia				150 160			Field Decor	itamination:	YN	Field Filtered:	YN	COC Number		indi O Othor (opcony,
Number	Code	Volu	me Pre	servative	Intended A	Analysis and/o	or Method	Comments:								
									5016	X. :	0.02	0				
NRI	+	1-57	11	equal !	2 5	772			5.0.0		0.62	mgic	_			
1 001 4	الملا	(Oila	0 17	CUL OI	ity or	14-6		1								
					_/					<i>)\(</i>						
*INDICATO	7.0404	I LICENCE	IANE OTAE:	7ED :::::::		1 (Students		Signature(s):							
+ 0.4 for	TAKA	WEIERS!	HAVE STABL	ZEU WHEN	ONSEC	UTIVE REA	DINGS ARE	WITHIN:					W77	10.64 84 7	Esta	
BC6	Bolow C	round Surfa	Specific C	Onductiv	ity and Te	mperatur	e: ± 10	mv for Re	dox Poter	itial. ±				and Turbic	lity	
003		iouilo aulia	100	C - Centigrad	E	GS - Groun	ю биласе	mg/L - millig	ram/Liter	min - Minut	e N	IP - Measuri	ng Point	(QA - Quality As	ssurance

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page I of I

NERT, Henderson, NV Project Task Name: In-Situ CR Treatability Study Task Manager: Arul Ayyaswami Task No: Well ID: CTMW-015 Jacob Souza Field Samplers: Recorded by: Jacob Souza Date: 4/4/17 Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 23.78 Screened/Open Interval Top: 19.00 (ft BGS) (ft BMP) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: 24.00 (ft BGS) (ft BMP Pump and Tubing Type:QEDS ample Pro/ poly tubena Pump Intake Depth: (ft BGS) 23.01 MP Description: T.D.C. (ft BMP) Equipment Decon. Method: Liquinox & water (73) Depth to Water Before Pump Installation (ft BMP): 22,24 Time: 0805 GW Disposal: GW- 11 portd PURGING Temp. pH Spec Conductivity **Dissolved Oxygen Redox Potential Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* Time READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) 0832 23.88 7.15 8970 3,40 206 80.2 22,30 100 0 0837 24.96 7.29 8980 2.54 195 30.2 100 22.29 500 0842 25,20 7.29 9000 2.28 190 16.1 100 22.29 1000 0847 25.54 7.37 9010 1.99 185 9.1 100 22.29 1500 0852 25.59 7.36 9040 182 1.77 4.60 100 22.29 2000 0857 25.70 7.39 9170 1.76 176 1.0 100 22.29 2500 0902 25.76 9080 7.41 1.84 176 0.0 3000 100 22.29 0907 25.78 9080 7.42 .71 174 0.0 22.29 100 3500 0912 26.04 9070 7.43 סדוו 175 0.0 100 22.29 4000 0917 25.99 7.44 9070 1.76 174 0.0 22.29 100 4500 0922 24.08 7.44 9060 1.72 173 0.0 100 22.29 5000 0927 26.10 7.44 9080 1,71 170 0.0 22.29 100 5500 Sample ID: CTMW-015 - 20170404 Duplicate ID: NA QA/QC Samples/ID: NA COC Time: 0932 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrous Iron = 0.02 mg/L Suffide = 0.00 mg/L Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centionade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

TETRATECH

LOW ELOW COOLINDWATER CAMPLING LOC

Page <u>| |</u> of <u>2</u>

							OVV FLC	אט שעל	DUNDY	MIEK	SAIVIPL	ING LC)G		N/	ERT, Hender	son, NV Projec
Task Name:	In-S	situ	CR"	Treatabi	lityStuc	Task Manag	er: Arw	l Ayya	swami		Task No:	MIZ			Well ID: C	TMW-	010
		9	<u>ع طد</u>									V. Jacob	Souzo	L		/3/17	
Well Depth (-			stance AGS ((ft BMP): 4	9.41		pen Interval T		/		34.00	(ft BMf
Well Diamet			0=5	PID/FI	D Readings I	Beneath Inner	Cap (ppm cg	1				pen Interval E	Bottom:			49.00	(ft BMF
Pump and T	ubing 1	ype: (350,	Sample	120/	soly tu	beng	Pump Intake			(ft BGS)			(ft BMP)	MP Descripti	ion: T.D.C	م د
Equipment L	_		d: AIC	wox c Ma	THE (X	3)~		Depth to Wa	iter Before Pu	mp Installation	n (ft BMP): 2	22.37	Time: (1926	GW Disposal	1: GW-11 p	iond
	PURGING	2		emp.		Н	Spec Cor			d Oxygen	Property of the second	Potential	A STATE OF THE PARTY OF THE PAR	bidity	Purge	Depth to	Cum. Vol.
		<u>₹</u>	READ	*C) CHANGE*		Units)	(uS/		The second	mg/L)		(mV)		TU)	Rate	Water	Purged
Time	12/15			CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1318	++	_	4.08		6,93		13600		2.12		215		321		180	22.80	Ø
1321		_ 1	0,32		7,89		14300		1,57		211		196		180	22.96	540
1324	11		9.69	,	7.08		14400		2.03		209		165		180	22.90	1080
1327			1.85		7.10		14300		1.75		194		146		180	22.91	1420
1330			9.79		7,14		14300		1.67		184		122		180	22.94	2160
1333			7.45		7.13		14300		1.78		180		107		180	22.96	2700
1334			8,55		7.14		14400		1.80		172		81.3		180	22.97	3240
1339			8.44		7.13		14400		1.91		164		54,3		180	22.72	3780
@13	45			pped Ke	22 thi	unders	torms				155	-					
1445		20	1.33	- U	7.16		15100		2.14		155		533		120	22.61	3780
1448			4.58		7.11		15100		2.03		141		835		120	22.65	4140
1451		2	5,01		7.11		15000		1.84		137		722		120	22.68	4500
1454		25	5.09		7.04		15000		1.62		129		654		120	22.68	4860
1457	1 600	25	5.24		7.03		15000		1.67		115		406			22.75	5220
1500		25	5.36		7.05		15000		1,48		109		294		120	22.74	5580
Sample ID: (MT	W-	010.	-201704	03	Duplicate ID:	NA			975		ples/ID: NA		- 0		COC Time:	
Sa	mple (iner			TI BYE		Links By	Material Co					Clear Glass;	PE≂polyethyle	ene; O=Other (Specify)
Number	Mate		Volum				Park II	A SPAN	Field Decon	tamination:		Field Filtered:		COC Number			-1
Number	Cod	e	VOIUN	ie Pres	servative	Intended A	Analysis and/o	r Method	Comments:								
		+							Fer	rous I fide=	ron=	0.07 n	ng/L				
		_				,			Sul	fide=	0.03	malL	5				
									1			7					
									Signature(s	s):							
*INDICATOR	RPAR	AMET	TERS H	AVE STABLE	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:	,	20	1974	- 6	125		1700	
± 0.1 for	oH:	± 3°	% for \$	Specific Co	onductivi	tv and Te	mperatur	e: ±10	my for Re	dox Poter	ntial: ±	10% for D	issolved	Oxvaen a	and Turbic	lity	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

LOW FLOW GROUNDWATER SAMPLING LOG

Page 2 of 2

NERT Henderson, NV Project

Task Name:	In-S	itu CR	Treatabi	J.t. St. J	. Task Manan	or And	Λ	2000		Took May	44.0					Son, IVV Flojec
Field Sampl	ers. T	ach G	N1370	11H 31KG	d rusk manag	בשוח ייים	L MUUO	WINCH!	<u> </u>	Task No:	MIZ				MW-01	7
Well Depth (istance AGS	(4):		Wall Dank	4 DUDY L	9.41		v: Jaco)za_		/3/17	
Well Diamet		2			Beneath Inner	C /	Well Depth	RBMP): 4	7,41		pen Interval T				34.00	(ft BMP
Pump and T	uhina Tu	mai (DEN	Sample	Physical	n. L. L	Cap (ppm cg		<u>/</u>			pen Interval B				49.00	(ft BMP)
Equipment [lecon M	lethod: 14	gwnoxs	1100/p	V 2	ma	Pump Intake			(ft BGS)	41,50		(ft BMP)		on: T,O,C	
Edabuteur								iter Before Pu	mp Installatio	n (ft BMP):	72.3	/ Time: (0926	GW Disposa	1: GW-11	boug
	PURGING	Т	emp.		H	THE RESERVE OF THE PARTY OF THE	nductivity		d Oxygen	STATE OF THE STATE OF	Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
			(°C)	1 20.	Units)	School of Paris	/cm)	THE RESERVOISION	mg/L)	ORF	(mV)	(N	ITU)	Rate	Water	Purged
Time	1518		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1503		25,45		7.10		15000		1.51		198		208		120	22.73	5940
1507		25,47		7.03		15100		1.59		97		143		120	22.74	6420
1511		25.51		7.65		15100	29	1.58		99		128		120	22.74	6900
1515		25,52		7.03		15100		1.53		100		111		120	22.74	7380
1519		25,51		7.03		15200		1.56		97		967		120	22.74	7860
1523		25.53		7.03		15200		1.57		91.810	0	91.8		120	22.74	8340
1527	527 25.54 7.02 15200 1.59 99 90.1													120	22.74	8820
1531		25,53		7,03		15200		1.55		100		84,7		120	22.74	
	- -		[7]					1.00		100		01,1		10120	44.17	9300
	-										!					
/-																
	\															
				/								$\overline{}$				
0I- ID-	<u> </u>									<u> </u>						
			1-2017	2070	Duplicate ID:	NA					ples/ID: N				COC Time:	1535
29	Materia	ontainer	-					Material Co	des: VOA = 4	0 ml glass via	il; AG =Amber	Glass; CG =			ene; O=Other (Specify)
Number	Code		me Pre:	servative	Intended A	nalysis and/o	r Method	Comments:	tamination:	YN	Field Filtered:	YN	COC Number	r	-	
					Managari	indiffuo dife	HIGHIOG				A 0H					
								1-er	rous	LIZON =	- 0,0 1	mgiL				- 1
								Su	lide:	= 0,03	: 0.07 Bright					J
									0		7					
								Signature(s	s):							
INDICATOR	PARA	METERS H	IAVE STABLI	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN	0.0000000						W.	
± U.1 for I	Dela C	t 3% for	Specific C	onductiv	tv and Te	mperatur	e: ±10 i	ny for Re	dox Poter	ntial: ±	10% for D	issolved	Oxygen a	and Turbic	lity	
- ÇOB	RGIOM G	Ground Surfa Measuring Po	ce (C - Centigrad	e of Custody	GS - Groun	d Surface	mg/L - millig	ram/Liter olts	min - Minut	e M	IP - Measuri		(QA - Quality As	ssurance

mV - milli Volts

ml - millititer

NTU - Nephelometric Units

QC - Quality Control



Page ___ of ___

	T. 6	1 - 0-	_ \		L	OW FL	OW GR	OUNDY	VATER	SAMP	LING LO)G		N	IERT. Hende	rson, NV Projec
Field Come	ти-2	TUCK	Treatabi	11ty Stud	Task Manag	er. Aru	l Ayy	aswam	<u> </u>	Task No:	MIZ				TMW-	
Field Samp Well Depth	_							_		Recorded b	y: Jacob	500	za	Date: 4		,
Well Diame				istance AGS			Well Depth	ft BMP): 2	3.70	Screened/C	Open Interval 1	op:	/	(ft BGS)	19.00	(ft BMP
Pump and 1	ubina Ti	ma: OF h	Sample	D Readings I	Beneath Inner	Cap (ppm co	je akb):		,)pen Interval E			(ft BGS)	24.00	(ft BMP
Equipment	Decon. N	fethod: Li	gumox é i	- rump	120/pol	4 tubino	Pump Intake	Depth:		(ft BGS)		23.10	(ILBMP)		ion: T , O , C	
				_			-		mp Installation	THE R. P. LEWIS CO., LANSING, MICH.		Time: (7745	GW Disposal	1: GW-11	bwq
	PURGING SAMPI ING		emp. (°C)		oH Units)		nductivity /cm)	ACCUSATION NAMED IN	d Oxygen		Potential		bidity	Purge	Depth to	Cum. Vol.
Time	P A	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	mg/L) CHANGE*	79 DWG 10	(mV)		TU)	Rate	Water	Purged
0908	1 0	25.86		7.31	OTHER	9230	CHANGE	2.96	CHANGE	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0913		26.33		7,36		9220				187	-	1,4		105	22.50	Ø
0918	+-+-	26.45	-	7.37		9210		2.46		181		1.0		105	22.50	525
0923		26.51		7.40		9210		1,95		175		0.0		105	22.50	1050
0928	-	26.63		7.42		9210		1.86		الدا		0,0		105	22,50	1575
0933		26.87		7.46		9220		1.67		170	ļ	0.0		105	22,50	2100
0938		26,97		7.43				1.56		167		0.0		105	22.50	2425
0943		27.05				9440		1.65		160		0.0	<u> </u>	105	22.50	3150
0948		27.17		7.44		9270		1.67		160		0.0		105	22.50	3675
0953				7,45		9240		1.63		160		0.0		105	22.50	4200
0122		27,19		7.45		9230		1.56		161		0.0		105	22,50	4725
																
Samula ID.	7-AA\	1 000	0.15.01	2.5												
ampie iu:	mple Co	v- 025 - ontainer	201704	05	Duplicate ID:	NA			(QA/QC Sam	ples/ID: N	A-	100	27	COC Time:	958
Ja	Materia		-					Material Cod	des: VOA = 40) ml glass via	l; AG =Amber	Glass; CG =	Clear Glass; F	E=polyethyle	ne; O=Other (S	Specify)
Number	Code		ne Pres	ervative	Intended A	nalysis and/o	r Method	Field Decont Comments:	tamination:	YN	Field Filtered:	YN	COC Number:			
						naryalo ando	Wichiod		T.		100	. / 1				
								וטשרו	$\alpha n = 1$	28M= C	1.09 ma	51-				
		-						2014	ride = 1	U,UU W	1911					
		+														
NDICATOR	PARAI	METERS H	AVE STABLIZ	ZED WILEN	2 CONCEC	ITIVE DE L		Signature(s):							
t 0.1 for r	H: ±	3% for 5	Specific Co	onductivit	v and Ter	nnerstur	JINGS ARE	WITHIN:	lau D	41-1	100/ 5		422776727078047.F4F4		1,31	
BGS -	Below G	round Surfac	ce C	- Centigrade	41194 191	GS - Gmund	Surface	mo/l - million	am/l iter	ual: ±	10% for D	ssolved	Oxvgen a	nd Turbid	itv	

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control



LOW FLOW GROUNDWATER SAMPLING LOG

Page 1 of 1

NERT. Henderson, NV Project

T1.11	-70-	-) - 0		the second						O7 11077 L	-1110 E			N	ERI, Hender	son, NV Projed		
l ask Name.	<u>TU-</u>	SITUCK.	Treatab	Tity Stud	Lask Manag	er: Arw-	L Ayyo	<u>a wam</u>	i .	Task No: /	^\ I2			Well ID: C	TMW-02	20		
							27			Recorded b	y: Jaco	6 50U	za_	Date: 4	4/17			
Well Depth				Distance AGS			Well Depth (ft BMP): 4	9.18	Screened/C	pen Interval T	op:		(ft BGS)	34.00) (ft BMF		
Well Diame			PID/	FID Readings I	Beneath Inner	r Cap (ppm cg	e akb):			Screened/O	pen Interval E	otlom:		(ft BGS)	49.00			
Pump and T	ubing Ty	pe:QED	SAmple	Pro/p	oly tu	prind	Pump Intake	Depth:		(ft BGS)		41.50	(ft BMP)	MP Descripti	ion: T, O, C			
Equipment (muox	water	(x,3)		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP): 🦸	22.67	Time:	220		GW-IID			
	<u>0</u> 9	Te	emp.	F	ЭН	Spec Cor	nductivity	Dissolve	d Oxygen	Redox	Potential	70 Turk	oidity	Purge	Depth to	Cum 1/-1		
			(°C)	(pH	Units)	(uS	/cm)		mg/L)		(mV)		TU)	Rate	Water	Cum. Vol. Purged		
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)		
12.54		28.07		7,49		12600		2,56		132		556		120	23.09	Ø		
1259		27.75		7.48		12900		1.54		133		372		120	23.15	600		
1304		27.76		1,50		13000		1.25		131		237		120	23.15	1200		
1309		27.71		7.52		13000		1.22		3	1	263		120	23.15	1800		
1304		27.70		7,50		12906		1.27		130		246		120	23.15	2400		
1319		27.79		7.51		12900		1.12		130		166	-	120	23.15	3000		
1324		27.82		7.52		13000												
1329		27.78		7,53		12900		1.24		128		111		120	23.15	14200		
1334		27.74		7.53		12900		0.98		127		83.0		120	23.15	4880		
1339		27.77		7.50		12900		1.21		127		70.1		120	23.15	5400		
1344		27.78		7.58		12900		1.12		123		45.1		120	23.15	6000		
1349		24 27	79	7.59		12900		1.15		122		39.7		120	23.15	(0000		
1354		27.82		7.62		13000		1016		119		31.5		120	23.15	7200		
1357		27.83		7.62		12900		1.17		120		31.1		12.0	23.14	7800		
1401		27.81		7.63		12900		1.18		120		28.9		120	23.13	8400		
Sample ID:			-20170	404	Duplicate ID:	CTMW-	020-2							<u> </u>	COC Time: O	205		
Sa		ontainer			- Di		J. 183	Material Cod	des: VOA = 40) ml glass via	al; AG =Amber	Glass; CG =	Clear Glass;	PE=polyethyle	ene; O=Other (S	Specify)		
Number	Materia Code		ne Pr	eservative	Intended A	Analysis and/o	c Mothed	Field Decon	tamination:	Y N	Field Filtered:	YN	COC Number					
	5000	Voidir	1	DOCT FEBRUARY	micitoco A	ilalysis allulu	Method	Comments:	_ ~		0112011							
		1						1-20	ר המונסג	LIVEY) -	O.llmg/l mg/L							
								1 5u	Itide =	. 0 ,04	mgiL							
								Signature(s	i):									
INDICATOR	R PARA	METERS H	AVE STABI	IZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:		-11.001-					- C 1			
TU.1 TOF	Bolow C	Fround Surface	Specific (C - Centiorada	tv and Te	mperatur	e: ±10 r	nv for Red	dox Poter	tial: ±	10% for D	issolved	Oxygen a	and Turbic	lity			

BGS - Below Ground Surface PMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surfaction

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control



TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page 1 of 1

Task Many		11 00		1) (1)		^					-IIVG LC	76		N	ERT, Hender	rson, NV Projed
Task Name	This	itu CR	Treatabil	11ty Stud	Task Manag	ger. Altu	UL Ayu	aswa	mi	Task No:	M12			Well ID: C	TMW-0	3\$
			Souza		<i>J</i>			J		Recorded b	y: Jaco	6 50U	Za	Date: 4/5	5/17	
Well Depth				istance AGS (Well Depth (ft BMP): 24	4.37	Screened/C	pen Interval 1	op: /		(ft BGS)	19.0	OO (ft BMF
Well Diame			[PID/FI	ID Readings I	Beneath Inner	Cap (ppm cg	ge akb): /			Screened/0)pen Interval E	Bottom: /		(ft BGS)	24.	OO (ft BMF
Pump and 1	ubing Ty	rpe: QED	Sample	-rro/	poly tw	beng	Pump Intake	Depth:		(ft BGS)	23.20		(ft BMP)	MP Description: T.O.C.		
Equipment			junox E	. Water	(x\2)		Depth to Wa	ter Before Pu	ımp Installatio	on (ft BMP): 22.40 Time: 1114			1114	GW Disposal: GW-11 pond		
	PURGING SAMPI ING	Т	emp. (°C)		oH Units)		nductivity /cm)		ed Oxygen mg/L)		Potential P (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	S P	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1125		27.77		7,35		9260		2.89		158		0.2		105	22.40	8
1130		27.62		7,30		9320		2.28		157		0.0		105	22.40	525
1135		27.92		7.35		9290		2.20	1	160		0,0		105	22,40	1050
1140		27.89		7.31		9280		2.11	<u> </u>	158	<u> </u>	0.0		105	22,40	าราร
1145		27,73		7.35		9310		2.00		140	 	0.0		105	22,40	2100
1150		27.84		7.33		9290		2.22		159		0.0	1	105	22,40	2625
1155		27.61		7,33		9330		1,89		160	 	0,0		105	22,40	3150
1200		27.80		7.34		9330		1.89		162		6.0		105	22.40	3675
1205		27.82		7.34		9350		1.88		161	-	0,0		105	22.40	
	1-1-			1.0		1000		1,00		107		0,0		100	24,40	4200
-																_/
	-															
Sample ID:	CTAN	1 - 626	-20170	1105	D !! ID.	N IA										
		ontainer	1-20110	705	Duplicate ID:	IVA		N-1 10			ples/ID: N		10		COC Time: /	210
	Materia						AL	Field Decor	des: VOA = 4	U mi glass vii	Field Filtered	r Glass; CG =	Clear Glass;		ene; O=Other (Specify)
Number	Code	Volum	ne Pres	servative	Intended A	and/o	r Method	Comments:		1 14	riciu riitereu.	IN	COC Number	:		
								Fer	rous I	ron=	0,00 m	9/1				
								Su	gide.	= 0.0	0,00 mg/	_				
								Signature(:	_		7					
'INDICATO	RPARA	METERS H	AVE STABLI	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN						1400		2
± 0.1 for	pH: :	t 3% for	Specific C	onductivi	tv and Te	mperatur	e: ± 10 r	nv for Re	dox Poter	ntial: ±	10% for E	issolved	Oxygen a	and Turbic	ditv	
BGS -	or pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity GS - Below Ground Surface															

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page of

Task Name: In-Situ Cr Treatability Studyask Manager: Arul Ayya Swami NERT, Henderson, NV Project Task No: M12 Well ID: CTMW-03D Field Samplers: Jacob Souza Recorded by: Jacob Souza Date: 4/6/17 Well Depth (ft BGS): / MP Distance AGS (ft): / Well Depth (ft BMP): 39,50 Screened/Open Interval Top: 34,00 (ft BGS) (ft BMP) Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: / 39,00 (ft BGS) (ft BMP) Pump and Tubing Type: QED Sample Pro /poly tubing Pump Intake Depth: (ft BGS) 36.50 (ft BMP) MP Description: TOC Equipment Decon. Method: 194100X 5 WOTER (X3) Depth to Water Before Pump Installation (It BMP): 22,47 Time: 0750 GW Disposal: GW- 11 DONC PURGING Temp. Ha **Spec Conductivity** Dissolved Oxygen Redox Potential **Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* Time READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) 0825 21.14 10.30 10500 3.47 291 13.0 22.49 120 0 0830 21,97 6.89 10500 3.35 2660 11.9 22.49 120 600 0835 22,51 10500 7,24 3.30 244 9.5 1200 120 22,49 0840 22,70 7.33 0090 2.89 236 4.0 120 22.49 1800 0845 22,85 7.40 10900 3.38 3.6 226 120 22.48 2400 0850 22,93 7.42 10900 3.40 2.8 220 120 22.47 3000 0855 22,93 7.43 0000 3.43 ZNo 2.6 120 22.46 3600 0900 22.94 7.43 10900 3,39 214 2.1 120 22.45 42.00 Sample ID: CTMW-035-20170406 Duplicate ID: NA QA/QC Samples/ID: NA COC Time: 090/0 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrous Iron= 0.00 mg/L Sulfide= 0.00 mg/L Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody ID - Identification

GS - Ground Surface

mo/L - millioram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page / of \

	575							OUNDWATER	SAMPI	LING LC	G		N	ERT, Hender	son, NV Proj
Task Name:	In-Si	tu Cr Tra	eatability S	<i>study</i>	Task Manag	ger: Arvl	Ayyaswa	ami	Task No:				Well ID: C	TMW-0	45
Field Sample	ers: D	· Kendy					- 11	<u> </u>	Recorded t	y: D. Ke	ady		Date: 4-4	5-/7	
Well Depth (f				istance AGS (Well Depth	(ft BMP): 74.00	Screened/0	Open Interval T	op:		(ft BGS)	19.00	(ft BA
Well Diamete	er (in):	2	PID/FI	ID Readings E	Beneath Innei	r Cap (ppm c	1		Screened/0	Open Interval E	Bottom:		(ft BGS)	24.00	(ft Bi
Pump and Tu	ubing Ty	pe: QED	SamplePr	o; poli	1 tulung		Pump Intake			23.00		(ft BMP)	MP Descripti	ion: TOC	
Equipment D	econ. M	ethod: 3	bucket ri	mse'		/	Depth to Wa	ater Before Pump Installation	(ft BMP):	22.37	Time: (0280	GW Disposa	II: GW-/1 Por	1
	PURGING SAMPLING	T	emp. (°C)		oH Units)		nductivity i/cm)		Redox Potential ORP (mV)		1.75ml 9/32 - 7mm/ 1 c	bidity (TU)	Purge Rate	Depth to Water	Cum. Vo Purged
Time	P S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	HONEXO CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(mi)
0910	X	22.71		7.36		9.17		1.27/2.27	132		9.0		100	22,40	d)
0915	X	23.11		7.29		9.18		0.73/2.15	135		5.0	+	190		500
0920	Y	23.25		7.28		9.17		058/1.41	137		1.5		ļ ·	22.40	
0925	X	73.26		7.27	-		 			 			100	22.40	1006
	V	23.28		-	/	9.16		0.52/1.38	139		0.0	1	100	22.40	50
0930	1			7.27		9.16	V	0.53/1.36	139		0.0		100	72.40	2000
0935	X	STABL	LIZATIO	2											
-1															
\															
			ĺ										12		
											<u>. </u>		517		
										 		14			
						<u> </u>	-					KY-			
	\-										_/	8			
			-201704	105	Duplicate ID			52.9	QA/QC San	ples/ID:		12.00		COC Time:	1435
Sar	mple Co				Barrie	The Price		Material Codes: VOA = 40) ml glass vi	al; AG ≃Amber	Glass; CG	=Clear Glass;	PE=polyethyle	ene; O=Other (Specify)
	Materia							Field Decontamination:	Y N	Field Filtered:		COC Number			
Number	Code	Volur	ne Pres	servative	Intended A	Analysis and/	or Method	Comments:				_		·	
Alren +		1 - 1	120 5		2			Femous Iro Sulfide:	n: 0.6	92 me/1	_				
WENT #	עתציח	ur Irea	alify St	My SU	<u> </u>			C. IGH.	0.00	9					
								Balling.	0.00	myil					
									X + Z						
								I Cionalusada).	441						
NDICATOR	DADA	METERS	IAVE CTABLE	7ED 14# IEN	2 CONCEO	HITHE OF	DINION 15	Signature(s):			.				
NDICATOR	PARAI	METERS H	IAVE STABLE	ZED WHEN	3 CONSEC	UTIVE REA	ADINGS ARE	WITHIN	-	0	Notice Communication	11_21112 950513 5552		20	4
0.1 for p	H: ±	METERS H	Specific Co	IZED WHEN onductivi C - Centigrade	ty and Te	CUTIVE REA	re: ± 10	Signature(s): WITHIN: my for Redox Poter mg/L - milligram/Liter	ntial: ±		Dissolved MP - Measur			ditv QA - Qualily As	

Page of

NERT, Henderson, NV Project Task Name: In Situ Cr Treatability Study Task Manager: Arul Ayyawani Task No: 194-87600014 Well ID: CTMW-04D Field Samplers: D. Keady Recorded by: D.Kendy Date: 4-5-17 Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP); Screened/Open Interval Top: 33.99 (ft BGS) (ft BMP) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) 48.99 (ft BMP) Pump and Tubing Type: Q50 Sample Pro; poly tubing Equipment Decon. Method: Z bucket mire Pump Intake Depth: (ft BGS) 41.49 (ft BMP) MP Description: TO (Depth to Water Before Pump Installation (ft BMP): 22.62 Time: GW Disposal: GW11 Ford PURGING Temp. pН Spec Conductivity **Dissolved Oxygen Redox Potential Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) (VS/cm) PO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ Time CHANGE* READ CHANGE* CHANGE* READ CHANGE* READ (ml/min) (ft BMP) CHANGE* (ml) 7,50 1102 25.61 13.0 1.79/2.12 158 154 ZZ-65 100 25,12 Fell 7.39 13.3 0.13/1.11 156 153 500 Z2.69 100 75.09 1112 7,37 13.3 0.57/1.09 154 120 2271 1000 100 25.21 1117 7,30 13.3 0.46/1.10 74.8 154 22,71 100 1500 25.17 1122 7.27 13.3 0.37/1.12 153 48.7 100 7.2.71 2000 25,23 1127 7,76 17.3 0.24/1.09 52 34.1 00 22.71 2500 1132 75,78 7.23 13.3 80.1/15.0 151 25.2 22.71 100 3000 25.32 1137 7,22 13.3 0.70/1.09 149 18.1 100 22,71 3200 1142 75,35 ት.21 13.3 0.19/1.07 148 15.0 1.00 72.71 4000 25,37 1147 170 017/1.07 146 11.2 150 22.71 4500 1152 29.39 13.3 0.18/1.07 9.9 22.71 100 5000 25.40 1157 13.3 0.17/1.01 7.7 22.71 00 5500 25,41 13.4 12ez 0.18/1.19 144 100 22.71 6000 1207 25,44 チルチ 13,4 0.19/1.10 V (45 143 4.7 HE.SS 6500 00 X STABILLI ZATION 1215 Sample ID: CTM W-040 - 20170405 **Duplicate ID:** QA/QC Samples/ID: COC Time: 1215 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrow Iron: 0.00 mg/L Sulfide: 0.01 mg/C NERT INSTRUG Treatability Study Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential; # 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



WELL WATER LEVEL MEASUREMENT LOG

Page ___ of ___

NERT, Henderson, NV Project

Task Name: In-Situ Cr T.S.	Task No: M12	Date: 5-2-17
Task Manager A. Ayyas wami	Field Sampler(s): D. Kendy	Recorded by: D. Keady
Equipment Model/Type:	Serial Number:	Last Calibration Date:
Solinst 101 Water Level Moter	K1 1515	

SOLATI TO LAMBOR SC	, , , , , , , ,		K1 1015		
Well Identification	Measuring Point (MP)	Time	Depth to Static Water Level	Well Sounding Depth	Condition of Well and
	1 4	(hrs)	(ft BMP)	(ft BMP)	Well Seal
CTIW-OIS	TOC	0806	22.15	23.65	Good
CTIW-OID	TOC	0808	22.41	38.62	Good
CTIW-025	TOC	0933	22.20	24.38	Difficult to remove ap
CTIW-02D	TOC	0936	23.21	47.78	Difficult to remove cap; u
CTIW-03S	Toc	0819	22,35	24.22	Copo
CTIW-03D	Toc	0928	NMSA	49.26	Under pressure; Ditties
CTMW-015	TOC	0938	22.25	23.78	Good
CTMW-01D	TOC_	0942	Z2.43	49.42	Good
CTMW-02S	TOC	0947	72,79	23.66	Good
CTMW-02D	TOC	0949	22.96	49.19	Good
ctmw-035	TOC	0952	22,41	24.35	Good
CTMW-03D	TOC	0954	22.56	39,49	Good
GTMW-045	TOC	0956	22.6	24.01	Good
CTMW-04D	TOC	0958	22.75	49.07	Good
* Unable to obtain	h DTW:	water !	evel meter	dops not bee	p to indicate
preserve of vate	r in well	: thick	slimy neiso	ive on avo	a observed
which may b	e interfer	he w/	DHG : de	contaminated	probe and
tried several	times at	differe	At TENPLIO	+ Concitivit	y, unsucessful
				9-6-11-7	, , , , , , , , , , , , , , , , , , , ,
All injution w	ells obse	cred to	have extr	mely strong	29 putrix odor,
similar to nothing	1_ (ran	reroit.	and very +	hick willow	- a cape Shipe
residue observed	Oh W	afor les	el meter o	the remove	re from each well.
Water used for	desanta	min Ating	a Absenced	to have who	+ appears to be
the try oil dray	a letr and	ilia due	to in illate	10 1010	1 SPICKIT 10 SE
	1 ' 1	/	l I	·	
A Oblamed Theo	fuce on	h and	40.0		
Well on 5.3.17:	DIO 7	re win	a ho		
A Obtained interwell on 5:3.17:	100 J - 7	5 -2-4 (L-1	me		
5.3./7	1/11/1 - 2-0	21/11/			
		4	-57-17		
		-			

TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

QC - Quality Control

Task Name:	In-S	ith Cr7	trealabili	it-1/Stuly	Task Manag	er: Arvi	Aurasi	ami		Task No:	M12			Well ID:	TMW-	DIS.
Field Sample	ers: D	, K-eadi	1	7			1/2(00	20.11		Recorded b	y: D.Ke	ade.		Date: 5	3-17-	213
Well Depth (t BGS):		7 MP Di	istance AGS ((ft):		Well Depth	(ft BMP): Z	3. 78	Screened/C	pen Interval T	00:		(ft BGS)	19	(ft BMP
Well Diamete		7 -	PID/FI	ID Readings I	Beneath Inner	Cap (ppm co	je akb):	-		-	pen Interval E			(ft BGS)	74	(ft BMP
Pump and Ti	ibing Tyr	эе: 😿	Mega Mo	n(001 ; 1	xoly tubitu	1	Pump Intake	Depth:	-	(ft BGS)	-	5.01	(ft BMP)	MP Descripti		(11 51111
Equipment D	econ. Me	athod: 3	bucket r	MEC	0		Depth to Wa	iter Before Pu	mp Installation			Time: C		GW Disposa		bud
	ပ္ ပ္ခ	Te	emp.	The r	Н	Spec Co	nductivity	-	d Oxygen	P-12	Potential		oidity	DESCRIPTION OF		
100	8 2		(°C)		Units)	Mus		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	mg/L)	ALCOHOL: NO	(mV)	1004 LUX ROTE	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ		READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0755		27,43		5,49		12.0		3.592.7	8	-33		283		100	22.76	Æ.
0800		27:35		5.75		12.1		1.58/25		-68		179		100	2278	700
0805		28,15		5.71		12.0		098/2-2		-88	-	40.2		100	22.80	100
0180		78.06		5.77		12.8		0.73/1.78		-129		72.3		100		1200
0815		28.63		5,91		13.4		0.77/1.96		-147		30.0		100	Z2.81	
0820		28.56		5.93		13.5		047/19		-153		76.5			22.82	2000
0825		28.64		5.90		13.7		0/69/1.92		-157				100	2283	2500
0830		2867		5.94		14.0		0.53/1.88		-155		29.8		100	22.83	300
0835		28.69		5.92			}	V AD 11 41				72.7		100	72.83	3500
0840		28.70				14.0		0.48/1.84		-160		18.8		100	22.83	4000
0842		28.72		5.95		14.2		0.46/1.9		-163		16.5		100	22.83	4100
D850		28.73		5.95		14.2	. /	0.44/194		-165		16.0	/	100	25-83	2000
				5.96		14.2		0.43/1.87	· V	- 66		15.5	V	100	2283	STO
0822	X	STAR	HEATT	N												
										>1=						
Sample ID:	CTION	1-016	3.5			Name and the				0	7-3-17					
Sample ID: (nple Co	ntainer	-201701	07	Duplicate ID:					QA/QC Sam				2 1000	COC Time:	255
00	Material							Field Decon	des: VOA = 40 tamination:	0 ml glass via	il; AG =Amber	Glass; CG =			ene; O=Other (S	Specify)
Number	Code	Volum	ne Pres	servative	Intended A	nalysis and/o	or Method	Comments:	tamination.	1 1/4	Field Filtered:	YN	COC Number			
									Fem-5	Fron :	0.00	nglL	an	ind water	1 /	
In-S	A) /	CS?	Samply	ra C	170			1	Sultito	: 0.0	00 mg/		000	ind water	: (loud Whit	4, 1
1109		1	1	8				Į.			112				Whit	ا ع
								1	1	15()	 					
INDICATOR	PARAM	/FTERS LI	IAVE STABLI	ZED MUEN	3 COMPEC	LITIVE DE A	DINCEAR	Signature(s):		1					
± 0.1 for a	H: ±	: 3% for !	Specific Co	onductivi	tv and Te	mneratur	DINGS ARE	: WITHIN:	dov Boton	stint. +	400/ 5		•		5.2	
BGS - I	Below Gr	round Surfac	ce C	C - Centigrade		GS - Groun	d Surface	mg/L - milligi		min - Minut		ISSOIVED IP - Measurir		and Turbic		
BMP -	Below Mi	easuring Poi	int C	COC - Chain	of Custody	ID - Identific		mV - milli Vo		ml - mililite			IG POINI ometric Unite		QA - Quality As	

ml - milliliter

NTU - Nephelometric Units



NERT, Henderson, NV Project Task Name: In-Situ Cr Treatability Study Task Manager: And Ayya j wami Task No: ////2 Well ID: CTMW-DID Field Samplers: D. Kendy Recorded by: Date: 5-3-17 Well Deoth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) 34 (ft BMP Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) (ft BMP) Pump and Tubing Type: MegaMonsoon; poly tubing Pump Intake Depth: ---(ft BGS) 41.70 MP Description: TOC (ft BMP) Equipment Decon. Method: 3 hucket rings Depth to Water Before Pump Installation (ft BMP): 27.4) Time: 09 10 GW Disposal: G-W-//fond PURGING SAMPLING Temp. Hq **Spec Conductivity** Dissolved Oxygen **Redox Potential Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) M(dS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* READ CHANGE* READ Time CHANGE* READ CHANGE* READ (ml/min) (ft BMP) (lm) CHANGE* 27.46 17.5 000 1.03/2-87 82 7 000 22.78 $/\infty$ 27.09 1005 17.6 0.77/208 720 22.90 100 T00 6.46 loto 26.96 /7;7-0.69 2.00 54 522 22.93 100 900 1015 26.93 6.50 13.7 59 478 062/171 /ଇଚ 22.94 1700 6.51 1020 26.80 17.5 0.55/1.69 67 266 22.95 2000 /oo 26.88 6.54 17:4 0.51/1207 1025 70 159 22.95 7500 100 1030 77.00 6.54 17.2 0.46/150 90.8 2275 /œ 7600 1035 2689 6.53 17.3 044/1.49 95.9 Zz.91 100 3000 1040 26.99 6.55 17.3 0.42/1.47 7 88.6 100 72.75 4000 1045 76.98 6.52 173 75 0.40/1.46 84.3 100 22.95 4500 1050 6.49 77.00 173 0.38/1,43 79 81.2 22.95 100 5000 STABILIBATOR 1055 Sample ID: CTMW-01D-20170503 **Duplicate ID:** QA/QC Samples/ID: **COC Time:** 1055 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrow Fron: 005 mg/L Suifide: 0:01 mg/L ひっしっして Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

-	It	
	_	J

TETRATECH

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

LOW FLOW GROUNDWATER SAMPLING LOG

Page _____ of ____

QA - Quality Assurance

QC - Quality Control

NERT, Henderson, NV Project Task Name: In-Situ Cr Tregtal Tty Avdy Task Manager: ATV ATY as warni Task No: 1/7/2_ Well ID: CTMW-025 Field Samplers: Recorded by: D. Keady Date: 5-4-17 Well Depth (ft BGS): MP Distance AGS (ft): ---Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) (ft BMP Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: -(ft BGS) (ft BMP Pump and Tubing Type: OED Sample Pr; pdythring Bailer Pump Intake Depth: (ft BGSTBM+ MP Description: 100 (ft BMP) Equipment Decon. Method: 3 bucket the Lizerhox Depth to Water Before Pump Installation (ft BMP): 22.34 Time: 080 GW Disposal: GW-PURGING SAMPLING Temp. pН Spec Conductivity **Dissolved Oxygen** Redox Potential **Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) mfuS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* Time READ CHANGE* READ (mt) 30 CHANGE* READ CHANGE* (ml/min) (ft BMP) READ CHANGE* ATTEMPTED LOW FLOW: UNABLE TO GET FLOW; < 1 OF WATER EN WELL. 0820 WILL NEED TO BAIL ENSTEAD. 0835 BAILED NO.45 gallow OF WATER (3 WELL VOLUMES)
32.67 5:05 13.3 7.53 0900 0.450 1300 190 62.9 BAIL 14-17 CTMW-025-20170504 Sample ID: Duplicate ID: QA/QC Samples/ID: **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG ≈Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Ferrous Fron: 0.01 mg/L groundwater clear/no Sulfide: 0.00 mg/L color celor cloudy' Number Code Volume Intended Analysis and/or Method Preservative Comments: NERT IT IN CITS. Sampling Sylle Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity **BGS - Below Ground Surface** C - Centiorade GS - Ground Surface mg/L - milligram/Liter min - Minute MP - Measuring Point

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

				L(UVV FL	JW GR	OUNL	WATER	SAMPL	.ING LC)G		N	FRT Hender	son, NV Project
Task Name: In	-Situ G	Treatal	LACYET.	Task Manag	er: Pru	Aya	\narr	<u> </u>	Task No:	MIZ		5555			
rield Samplers:	D. Kea	6-1				11/2	D • • • • • • • • • • • • • • • • • • •		Recorded b		end		Date: 5-	MMW-C	Щ
Well Depth (ft BG:	S):	/ MP D	istance AGS ((ft):		Well Depth	(ft BMP);	49.19		pen Interval 1	on:	_	(ft BGS)	34	(ft BMP)
Well Diameter (in)		PID/F	ID Readings I	Beneath Inner	Cap (ppm cg	je akb):		- 		pen Interval E			(ft BGS)	<u> </u>	(it BMP)
Pump and Tubing	Type: Meg	Monsooi	n; poly	tobing_	_	Pump Intake	Depth:		(ft BGS)	41.		(ft BMP)	MP Description		(ILDIMP)
Equipment Decon	Method: 3	bucket	mye			Depth to Wa	ter Before	Pump Installation	on (ft BMP): 7	22.96				GWIL	Rud
Time PURGING	MPLING	emp. (°C)		H Units)	Spec Co	nductivity	Disso	ved Oxygen (mg/L)	Redox	Potential (mV)	Turl	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REAL	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1302 X	31.53		5.83		14.7		0.86 2	50	213		308		100	23-42	0
1307 X	30.22		5.98		15,2		0.71/2		197		133		100	23.58	500
1312 X	29.68		6.02		15.3		0.62/		186		65.2			23.59	
1317 X	29.10		6.02		15.3		0.56/1		179		34.3		100		00
1322 X	28:43		6.06		15.5		0.51/		172		21.2		100	23.61	[500
1327 X	28.81		6.06		15.4		0.46/1		165		_		100	23.62	2000
1332 X	29.04		6.05		15.2		0.43/1.		157		16.3		00	23.63	5200
1337 X	29.45		6.03		15.0		0.39/1-		147		12.6		001	23.63	J000
1342 X	29.55		6,03		15.0		0.34/				8.0		00	23.63	3500
1347 X	29.27		6.02						136		8.8		100	23.63	4000
1352 X	29.29		6.02		5.0		0.37/1		134		7.5	,	(00	23.63	4860
1357 X	29.31		6.01		14.9			21	129		6.1		00	23.63	3000
1110					14.8		031/1	u	125		5.2		100	23.63	570
1) DAY	ILIZATI	M												
													36 734		
Sample ID:	70.5	36 36		Duelleste ID-	ETNALL	000	- 1-						033	73	
Sample	Container	20-20	70,03	Dupricate ID:	C[]V[W-	UZD -	2017	103-FD	QA/QC Samp	oles/ID:	N:	1 2	(COC Time: /	100
Mate							Material Field De	Codes: VOA = 4	0 ml glass via Y N	l; AG =Amber	Glass; CG =	Clear Glass; F	E=polyethyler	ie; O=Other (S	pecify)
Number Cod	de Volur	ne Pres	ervative	Intended A	nalysis and/o	Method	Commer		1 14 1	Field Filtered:	Y N I	COC Number:			
									In	D.14	mr./L		Lugb.	.	ĺ
AIFRY	tas	2	7	Sam	مالمات	Cal	ĺ	Ferrous Sulfir	1,0,1	7.07.7	711	gro	ward	: Vello	W-area
100101	7/10	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	110	Sarr	PVING 1	JUT	i	SUITIO	10 ·		my 12	Uc	olor	1010	0.37
	 		7		V_			,]	11		_				
NDICATOR PAR	AMETERS H	IAVE STARLE	ZED WHEN	3 CONSECT	ITIVE DEAD	JINICO ADE	Signatu								
O.1 for pH: BGS - Below	± 3% for	Specific Co	onductivit	v and Ter	nperatura	/////////////////////////////////////	WITHIN:	Paday Batas	stal.			_			
BGS - Below	Ground Surfa	ce C	- Centigrade	27777 701	GS - Ground	Surface	me/l - mi	ligram/Liter	mia Mart	19% for D	ssolved (Oxvoen a	<u>nd Turbidi</u>	tv	

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page ____ of _____

NERT, Henderson, NV Project Task Name: In-Situ Co Treat Ability Studiask Manager: Arul Ayyawani Well ID: CTMW - 035 Task No: M12_ Field Samplers: D. Keady Recorded by: D. Kead Dale: 5-5-17 Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP); 24.35 Screened/Open Interval Top: (ft BGS) (ft BMP) Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BG\$) 24 (ft BMP) Pump and Tubing Type: QED Sample Pro bladder; poly toby Pump Intake Depth: (ft BGS) 23 (ft BMP) MP Description: Equipment Decon. Method: 7 haket thre w/ highrox Depth to Water Before Pump Installation (ft BMP): 22.41 Time: GW Disposal: GW-11 Pord 07-45 PURGING SAMPLING Temp. pН Spec Conductivity Dissolved Oxygen **Redox Potential** Turbidity Purge Depth to Cum. Vol. MúS/cm) (.C) (pH Units) READ CHAN ORP (mV) (NTU) Rate Water Purged READ CHANGE* Time READ CHANGE* CHANGE* READ CHANGE* READ CHANGE* (ml/min) READ CHANGE* (ft BMP) (ml) 24.85 0754 X 5,49 9.21 3.41/2.99 244 1.2 Da 22.42 0759 X 24.79 5.95 9.27 2.05/2.00 86 0.9 22.42 100 0801 X 24.77 6.10 9.30 1.26/1.55 36 0.6 Z2.43 100 0809 X 24.78 6.20 105/1.63 12 0.6 22.43 180 0814 X 0.82/1.48 5 06 22.43 100 1819 X 24.82 6.27 0.5 22.43 100 0824 X 24.86 6.30 22.47 100 083D STABILIZATION Sample ID: CTMW-035-20/7000 **Duplicate ID:** QA/QC Samples/ID: **COC Time:** 08.7e Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: grandwite yellowgroon Ferrous Fron: 0.00 mg/c Sulfide: 0.00mg/c NERT INSTU COTES - Samping Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - millititer

MP - Measuring Point NTU - Nephelometric Units

Shrind	Ten	· D. A. 700 F														
TE		RATE			1.	OM EI			MATER	0.4440					Pi	agel of
Task Name	In-	Situ Co	Treators	12,56	- Task Manar	DE No. 1	OW GA	עאוטט	WATER		LING LO	OG		N		rson, NV Project
Field Samp	lers:). Kea	dy	THE YOUR	- OSK HIGHE	July Hol	HYY	nswami	-	Task No:	M12				CTMW-	
Well Depth	(It BGS):			istance AGS				(ft BMP): 3		Recorded t	ру: Д	cady		Date: 5	-5-17	
Well Diame	ter (in):	2	PID/F	ID Readings	Beneath Inner	Cap (pom c	an akkti		Metal		Open Interval 1	Гор:	_	(ft BGS)	34	(ILBMP)
Pump and T	ubing Ty	pe: QE	A Samola	Dr. Lla	180	1/5	Pump Intak	e Depih:		(ft BGS)	Open Interval E	1		(fi BGS)		(ALBMP)
Equipment (Decon. M	ethod: 3	but et	ringe w	Ligura	10	Depth to Wa	ater Belore P	ump Installatio	on (It BMP)		3% 3€. Time:	TO(ILBMP)		on: TO C	
-	ပ္ခ် နို	T	emp.		oH		nductivity	The second second second	ed Oxygen		72.54		0900	GW Disposal	: 6W-11	fond
	PURGING		(°C)	(pH	Units)	MUGS	i/cm)	DO	(mg/L)	ORF	Potential (mV)	1	bidity ITU)	Purge	Depth to	Cum. Vol.
Time			CHANGE*	READ	CHANGE*	READ	CHANGE*	PEAST	(mg/L) CHANGE	READ	CHANGE*	READ	CHANGE*	Rate (ml/min)	(ft BMP)	Purged
0907		76 29	The second secon	6.23		12.0		1.17/22		183		4.0	CITAINGE			(ml)
0912		76.03		6.37		12.0		0.97/20		182				100	22.66	
0717	X	26.18		6.43		11.9		0.93/20		183	-	2.3		00	22.66	1300
0922		24.24	-	6.47	,	11.9	1	0.95/20		183					22.68	1000
0927	X	26.37	1	6.47	V	11.9		1.02 /21		93	1	0.7		1	22.68	1500
0440	x	STIBE	ILLI ZATI	M				150		187		0.5		(00	72.68	2000_
- -																
\																/
					/											
	1				/											
-	- \										─ > \	X	-			
-												~5	5.12			
	11															
Sample ID: (MI	N-031	0-201	אסוס רי	Suplicate ID:					QA/QC Samp	de-dD.					
San	nple Co Material	itainer		, , ,				Material Co	des: VOA = 40	mi alace vial	· AC =Ambos	Clares CC. /	21- 01 -	C E=polyethylen	OC Time:	0140
Number	Material Code	Volum	Drose	ervative	fotomical a				ACM TALL PROPERTY !	Y N F	ield Filtered:	Y N	OC Number:	E=polyethylen	e; O=Other (S	pecify)
		- VGIUIT	F162	EL AGUAG	intended An	alysis and/or	Method	Comments:			-					
		C=2.	سد اه						Furny	Fron	: 0.0	one!	La	murdinal		
NEW	X	1-22	er +.	5 Jan	שמו מות	-SPA-			Cale	d	<u> </u>	0	N	color	" VIAIL	1-020.
					177	-0-41			9011.	·	KOP M	916	V	Color	Yelle	المحال

Signature(s): INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential:

BGS - Below Ground Surface BMP Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute mi - milliliter

± 10% for Dissolved Oxygen and Turbidity MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page of

Task Name: In-Situ Cr Treatability Study Task Manager: Hrul Ayyaswami NERT, Henderson, NV Project MIZ Task No: Well ID: CTMW-045 Field Samplers: Recorded by: Ceady Date: 5-4-17 Well Depth (ft BGS): MP Distance AGS (ft): ---Well Depth (ft BMP): 24,01 Screened/Open Interval Top: (ft BGS) (ft BMP) Well Diameter (in): 7-PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: Pump and Tubing Type: QFD Sample Pro: poly tubing
Equipment Decon. Method: 3 bucket not with the contract of t (ft BGS) 24 (ft BMP) Pump Intake Depth: -23 (ft BGS) (ft BMP) MP Description: TOC Depth to Water Before Pump Installation (ft BMP): Pand 22,61 GW Disposal: GIN-11 Time: 0930 PURGING SAMPLING Temp. **Spec Conductivity** pН Dissolved Oxygen Redox Potential **Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) M (dS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ Time CHANGE* READ CHANGE* CHANGE* READ CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) 0940 5.51 76.95 1.8 1.8 [/ 3.14] 168 27.8 22.69 00 0945 76,94 5.76 11.8 1.23/2.50 9.1 145 100 2270 M50 26.84 5.33 1.90/1.94 131 6.9 7271 100 26,78 0955 5.85 0.87 1.86 124 6.5 22.73 IDD 26.66 1000 5.83 11-8 121 0.80/1.48 6.5 22.73 100 26.51 1005 5.84 11.8 12 6.2 22.73 00 26.56 1010 5.83 11.9 120 6,0 22.73 dal 1015 STABILIZATION Sample ID: CTMW-045-20170504 **Duplicate ID:** QA/QC Samples/ID: **COC Time:** OIT Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Fernus Iron: 0.02 mg/L groundwater : Yellow-green NEBT IN-SHOUTS. Sample Set Sulfite: 0.00 mall Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity **BGS - Below Ground Surface** C - Centigrade

BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

Tt	TETRA TECH
111111111111111111111111111111111111111	

Task Name: In-Situ Co

Field Samplers: D. Kend y

Well Depth (ft BGS): -

Well Diameter (in): 2

LOW FLOW GROUNDWATER SAMPLING LOG

Task No:

(ft BGS)

Recorded by:

Screened/Open Interval Top:

Screened/Open Interval Bottom:

M12

Koad y

41.50

Ayyas wani

Pump Intake Depth:

Well Depth (ft BMP): 49.07

NERT, Henderson, NV Project Well ID: CTMW-04D (ft BGS) (ft BMP (ft BGS) (ft BMP) MP Description: TOC

Date:

(ft BMP)

	PURGING	T	emp. (*C)		H Jnits)	Spec Con	nductivity /cm)	Dissolved DO (n	na/L)		Potential (mV)	2236 G-8-34 J	bidity TU)	Purge Rate	Depth to Water	Cum. Vo. Purged
Time			CHANGE*	READ	CHANGE*	READ	CHANGE*	READ P	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1133	X	2801		5.77		14.9		2.65/3.06		194		314		100	22.95	Ø
1138	X	28.39		6.0)		15.0		3.19/2.72		194		153		100	Z2.96	500
1143	X	28.31		6.13		15.1		3.87/3.21		193		83.0		100	2296	1000
1148	X	28.51		6.19		15.		4.30/3.21		194		56.0		100	22.96	1500
1153	X_	28.62		6.20		15.0		5.06 3.64		196		3612		100	0/	7,000
1158	X	28.39		6.21		15.1		5.55/3.83		197		27.3		100	22.96	2500
203	X	28.6		6.20		15.0		5.78 /3.71		198		21.8		100	27.96	3000
208	X	28.68		6.21		15.1		6.03/3.0		199		17.7		00	22.96	3500
213	X	28.63		6.20		15.1		6.10/3.74		200		15.0		00	22.96	4000
1218	X	28,40		6,19		15.1		6.24/3-81		20		13.0		100	22.96	4500
223	X	28.34		6.20		15.1		6.22 3.74		705		122		Qo	27.96	2000
228	X	28.27	V	6.70		15.1	V	6.20/3.70		201	\checkmark	11.9		60	2296	5500
1230		STABI	LIZATION									•				
												DK	5-4-17			
mple ID:			4D-201		Duplicate ID:						oles/ID: LE		/			

Sample Container Material Number Code Volume Preservative Intended Analysis and/or Method

Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE≂polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number:

Comments:

Farrow Fron: 0.00 mg/L Sulfide: 0.00 mg/L

Signature(s):

*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:

Textability Stury Task Manager:

PID/FID Readings Beneath Inner Cap (ppm cge akb):

MP Distance AGS (ft):

Pump and Tubing Type: QED Sample Pro: poly thing

± 0.1 for pH; ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ±10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



WELL WATER LEVEL MEASUREMENT LOG

Page ___ of ___

NERT, Henderson, NV Project

Task Name: TN-577 C- T.S.	Task No: M12	Date: 5-14-17
Task Manager And Ayyayyan;	Field Sampler(s): J. Bunker, D. Cendy	Recorded by: J. Byhers, D. Keyl
Equipment Model/Type:	Serial Number:	Last Calibration Date:
Interface ProLe		

	Measuring Point	Time	Depth to Static Water Level	Well Sounding Depth Condition of Well and (ft BMP) to Maket Well Seal
Well Identification	(MP)	(hrs)	(ft BMP)	(ft BMP) to POLICE Well Seal
CTIW-OIS CTIW-OID	TOC	0747	22.29	/
CTIW-OID	TOC	0748	22.48	/
CTIW -025	TOC	0816	22.32	
CTIW-02D	Toc	0812	23.70	202.71
(TIW-035	TOL	0809	22.44	
(TIM-03D	TOC	0803	Z3.76	23.59
CTMW-015 CTMW-01D	Toc	0824	22.13	22.13 DK 4111 Watch 1864
	TOC	0820	22.54	1
GMW-025	TOC	0759	22.90	
(TMW-02D	TOC	0800	23.07	
(TMW - 035	TOC	0746	22.45	
CTMW-045	TOC	0754	22.71	
CTMW-04D	TOC	0755	22.88	
CTMW-03D	TOC	0751	22.57	_
		-		
		-		
			WALC	76-17
			naris	• • • • • • • • • • • • • • • • • • • •
<u> </u>				



	Task Name: In-Situ C Treatabality but Task Manager: Any Aygunami Task No: MIZ Well ID: CMW-015															
Task Name:	In:	Situ Cr	Treatal	07774344	Task Manag	er: Anu	AWasi	wam	i	Task No:	M12	_		Well ID:	TMW-C	210
Field Sample	ers: D	Keady	, J.Bur	reds		13	7776		-	Recorded b			unter	Date:	5-16-1	
Well Depth (it BGS):		MP Di	stance AGS (ft): ——		Well Depth (ft BMP):	73. 78	Screened/O	pen Interval 1	Гор:		(ft BGS)	19	(ft BMP)
Well Diamete	er (in):	Z	PID/FI	D Readings E	Beneath Inner					Screened/O	pen Interval E	Bottom:		(ft BGS)	2	(ft BMP)
Pump and To	ubing Ty	e: AEDS	ampelio (Ibdle?	- aly	tolize	Pump Intake	Depth:		(ft BGS)	72.13	22.78	(ft BMP)	MP Descripti		
Equipment D	econ. M	ethod: 3	bucket	ringe	All Lin	vihex	Depth to Wa	ter Before	Pump Installation	n (ft BMP):	22.2		07474		4 4 4 4	1 Pond
	l (n			_								0	1767-1	The state of		
	PURGING SAMPLING		emp. (*C)		H Jnits)	mus.	nductivity		ved Oxygen	The state of the s	Potential (mV)	THE RESERVE OF THE PARTY OF THE	bidity ITU)	Purge	Depth to	Cum. Vol.
-	AMP AMP	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Horiza	(mg/L)	The second second	AND VALUE OF THE PARTY OF THE P	CONTRACTOR LAND		(ml/min)	(ft BMP)	Purged (ml)
Time	0 0		CHANGE		CHANGE		CHANGE			READ	CHANGE*	READ	CHANGE*	(marian)	(IL DIVIE)	(1111)
0839	X	23.40		6.80		10.7		8.97	2.43	-54		70.8		100	22,43	Ø
0844	X	23.49		6.80		10.6		8.06/2	21	-82		70.3		100	22.48	500
0849	X	23.64		6,79		10.6		7.58/2	?.28	-12		71.4		100	22.53	1000
0854	X	23.88		6.77		10.6		7.10/1.	78	-173		70.5		100	72.56	1500
0859	0859 \ 24.00 \ 6.75 \ 0.6 \ 657/1.41 \ -206 \ 70.5 \ 100 \ 02.59 \ 2000 \ 0904 \ X \ 24.09 \ 6.74 \ 10.6 \ 6.49/1.42 \ -228 \ 69.8 \ 100 \ 22.62 \ 2500															
0904	0904 × 24.09 6.74 10.6 6.49/1.42 -228 69.8 100 22.62 2500															
0909	109 X 24.23 6.73 (0.6 6.17/1.36 -249 69.0 100 22.65 3000															
0914	909 X 24.23 6.73 (0.6 6.17/1.36 -249 69.0 (00 22.65 3000) 914 X 24.31 6.72 10.7 5.92/1.32 -265 67.0 (00 22.68 3500)															
0919	X	24.40		6.70		10.7		5.62/1		-280		62,7		100	22.71	4000
0924	X	24,38		6.69		10.7		5,43/1.		-290		60.5	/	100	22.73	4500
0929	X	24.39		6.68		10.7		5.38/1.		-298	V	59.0	V	100	22.76	5000
0930	X		LLIZAT	1 1								<u> </u>			J- /V	
(1	*		
															TES	-16-17
Sample ID:	CTM	W-0	15-2017	0516	Duplicate ID			18094-01		QA/QC Sam	nies/ID· -	1.77/2			COC Time:	930
Sa	mple Co	ntainer		300				Material	Codes: VOA = 4		5 100 100	er Glass: CG	-Clear Glass	· PF=nolvethy		
TEST N	Materia	-							contamination:		Field Filtered		COC Numbe		ierie, O-Otrier	(Opecity)
Number	Code	Volur	ne Pre	servative	Intended A	Analysis and/o	or Method	Commer		V65 V61	1988 1980			2	30	
								Fr	rrou In	n : 0.	72 ma	11	anı	nd water		ايدا
	_							1 '6	irrow Individue:	0 11		7		rober	, cloud	14 04
-NER		IA-S.Z	1 (r]	TS. S	two). Yo	Sp.		۱ ،	THE PARTY OF THE P		MAIL	(by of		o Alana		
-		-			1,,	7 00	,	l		5/1		Coll -	abble) usen	1	niple
*INDICATO	D DADA	METERR	HAVE STABL	IZED WUE	N 2 CONCE	CHTIVE DE	ADINOC 45	Signatu		1		401 0	unity H	MUI NH	ep verc	206/
									r Redox Po	tential	± 10% %	or Discol	und Over	en and Tu	ouls ialits e	
		round Surfa		C - Centigrad		GS - Grou			illigram/Liter	min - Minu		MP - Measu			OA - Quality A	Esticanco

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control





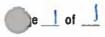
LOG NERT, Henderson, NV Project

	Name: In-Sit Comercia bility Study Task Manager: And Ayyas warni Task No: M12 Well ID: CTMW-01D														1		
Task Name:	In:	SAU C	Treatab	ility Study	Task Manag	er: And	Ayyasu	Mani	•								
Field Sample	ers: D.	Leady	J. Bun	kers							Recorded b			Bunkers		-16-17	
Well Depth (-11	MP Dis	stance AGS (t):		Well Depth (ft BMP):	49	1.41	-	pen Interval T			(ft BGS)	34	(ft BMP)
Well Diamet	er (in):	2	PID/FII	D Readings E	leneath Inner	Cap (ppm c	ge akb):				Screened/O	pen Interval E	lottom:		(ft BGS)	49	(ft BMP)
Pump and T	ubing Ty	pe: QED	Samplefr	o/blatter) poly d	שמישע	Pump Intake	Depth:			(ft BGS)	41.5	50	(ft BMP)	MP Description		
			bucket c				Depth to Wa	ter Before	е Рип	np Installatio	n (ft BMP):	22.54	Time:	0829	GW Disposal	GW-11	Pond
	PURGING	To	emp. (*C)	р	H Jnits)	The second second	nductivity /cm)			Oxygen	The second control of the second control of	Potential (mV)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	UBG	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Harita To REAL	1	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
Time	<u>~ ~</u>		Show the second			13.2		-	41		-33		3 2 5		100	22.70	
055		24.97	1	7.33		13.6			· []		-3	-	256	-	100	22.76	
1100	X	25.55		7.42					_		-30	 	202		100	27.80	
1105		25.73		7.44	-	13.7		4.83			-28	-	152		100	27.82	
1110	X	25.89		7,46	-	13.8		4.52/1			-26		90.3	}		22.84	
1115	X	24.21		7.7+		13.8			-22				<u> </u>	1	100	22.85	
1/20	X	26.39		7.47		13.9		4.04/	+		-25		70.8		100	ZZ-85	
1125	X	76.63		7.47		13,9		3.92/1			-24	-	42.8	-	100	22.85	
1130	X	27.02		7.47		13.9	ļ,	3.79			-Z3		//.0	/	100		
1135	X	2709		7.46		13.9	1/	3.69	1.14		-Z3		4.8		100	22.85	
1145	X		BILIZA	1 1 1 1				1						ļ)
1																	
																5-16-1	7/
\																5/14)	
\ <u></u>	1-1-														D		
			 												a		
Sample ID:	cTm	W-OID	-201705	110	Duplicate II	D:					QA/QC Sar	nples/ID: -				COC Time:	1145
S	ample C	ontainer	201701					Materi	al Co	des: VOA =	40 ml glass v	ial; AG =Amb	er Glass; CG	a =Clear Glas	s; PE=polyethy	/lene; O=Othe	(Specify)
	Mater							Field D	Decon	ntamination:		Field Filtere		COC Numb			
Number	Code	Vol	ume Pre	eservative	Intended	Analysis and	Vor Method	Comm	ents:	-		7	III.	17			ellor-green
										Ferr	ou tr	in: U	של פוי	71-	drown	ducter	
HE)+			+	~ 1		-	11		Sil	64.	0.00	my	L	10	or :4	eller-greek
NEL	117	N-7-4	v (r -	1.2	2 Jamp	ing of	J+	1		0		111	0				
					•	-V		Signs	ature((s):	DY	1			120		
*INDICATO	OR PAR	AMETERS	S HAVE STAB	II IZED WHI	N 3 CONS	FCUTIVE F	READINGS A					1/					
± 0.1 fo	r pH:	± 3% fc	r Specific	Conduct	ivity and	Tempera	ture; ±	10 mv	for I	Redox P	otential;	± 10% f	or Disso	Ived Oxy	gen and T	urbidity	
							7.500			0.00	6.00			16° 20°			•

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units





NERT, Henderson, NV Project

	7356	100				, .									, on , , , , , , , , , , , , , , , , , ,
Task Name: TM-S	sau Cr 1	reatab	774 Stud	Task Manag	er. Aru	1 Aura	[Nami		Task No:	M12			Well ID:	JMW -	025
Field Samplers: D	Keady.	J. Bu	nker			11			Recorded b	y: D, Ke	ady is	Runker	Date: 5	-16-17	
Well Depth (ft BGS):	- 10	MP Dist	tance AGS (ft):		Well Depth ((ft BMP):	23.70	Screened/C	Open Interval T	op:		(ft BGS)	11	(ft BMP)
Well Diameter (in):	2	PID/FID	Readings E	Beneath Inner	Сар (ррт с	ge akb): -			Screened/C	Open Interval E	Bottom:		(ft BGS)	ZY	(ft BMP)
Pump and Tubing Ty	pe: Man(sor	1 (elect	trio).	poly tul	-tha_				(ft BGS)	Z	3.69	(ft BMP)	MP Description	on: TOC	
Equipment Decon. M	ethod: 3 by 0	ket r	mre	w/Liqu	ir @X	Depth to Wa	iter Before F	ump Installatio	on (ft BMP):	22.90	Time:	·	GW Disposal	: GW-1) A	bosel
				н		nductivity	Dissolv	ed Oxygen	Redox	Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
PLIN	(°C)			Jnits)	M(MS			(mg/L)	I Shake the second of the second	P (mV)		TU)	Rate	Water	Purged
ewit PURGING SAMPLING	READ CI	HANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1347 X	33.10		6.78		10.8		5.77/1.9	9	-12		0.0	1	100	NN	Ø
(352 X	32.69		6.76		10.8	1	4.98/17		-35	1	0.0		100	Nh	500
	32.01		6.76		10.9		4.65/17	-	-44	+	8.0		•	Nm	1000
							4.55/1-	4		+			100	NM	1500
1402 X	31.50	.7	6.75		11.0				-48	-	0.0		100	NA	
1407 X	31.31	V	6.75		11.		4.49/1.1	18 V	-93		0.0	<u> </u>	100	///1	2000
1410 X	STARIT	13PT	8N			-									
	1410 X STAB LIZATION														
			<u>-</u>		<u>.</u>										
												15	A		
													ρ		-
												140			
												K	-		-
											10				
															
								 							
Sample ID: (TT)	250 [4]	2-1701	-11	Duplicate ID			1875 18	ļ	QA/QC San	nulae/ID:				COC Times	1410
Sample ID: CTTh		20170	714	Duplicate iD			Malorial (adan: VOA -		<u> </u>		- Close Close		coc Time: /	
Materia		-								Field Filtered		COC Number		iene, O=Other	(Specify)
Number Code	THE RESERVE THE PERSON NAMED IN	Pres	ervative	Intended A	Analysis and	or Method	Commen	S:	- 1940/168						
								Fei	mow II	an: 0.	16 ma	1	,	iter: cle	
								Ċ	ا لما	n 11 .	1. 0	g	round wa	iter da	24-
NERT	In-1	C 4.	6	TOAL	a 134 1	tran		OV	mac.	الرارا الأرا	IL a		colo	r Jn	color
1.6171	4	3 170		1100	1		₅₀	Man	y bubbl	utorraid	Mamer	celldin	or HACH.	r: Cle Stale ox	3.1
				3	<u> </u>		Signatur	e(s):	7				U , ,		.,
'INDICATOR PARA		=						**	1			75576	53		
± 0.1 for pH;										10000			en and Tu		
	Ground Surface Measuring Point		C - Centigrad COC - Chain		GS - Grou ID - Identi	ind Surface fication	mg/L - mi mV - milli	ligram/Liter Volts	min - Min ml - millili		MP - Measu NTU - Neph	ring Point elometric Unit		QA - Quality A QC - Quality C	
	_			-											





							OW GR		DW	ATER	SAMPL	LING LO	OG .		NE	RT, Henders	son, NV Project
			realability		Task Manag	er: Arul f	gygswa	mī				M12			Well ID: C	TMW-0	72D
Field Sample			, J. Bi								Recorded b	y: D. Ke	ndy, J.	Punkers	Date: 5-		
Well Depth (stance AGS			Well Depth ((ft BMP)	: 4'	9.18	Screened/O	pen Interval	lob:		(ft BGS)	34	(ft BMP)
Well Diamet		7_	PID/FI	ID Readings	Beneath Inne	r Cap (ppm c	T .					pen Interval 6			(ft BGS)	49	(ft BMP)
Fump and I	ubing iy	/pe: CVED	Sample Pro (Levaer ;		9	Pump Intake		_		(ft BGS)		1,50	(ft BMP)	MP Description		
Edaibilieur r			Luket ni	_	Liquinox		Depth to Wa	_	_			23.07	Time:	0715	GW Disposal	: GW-11	porq
	PURGING	T	emp. (°C)		oH Units)	A LOUIS CO. OF THE REAL PROPERTY.	nductivity	CHULAGASIN		Oxygen	CONTRACTOR NAMED IN	Potential		bidity	Purge	Depth to	Cum. Vol.
Time	AMP GMP	READ	CHANGE*	READ	CHANGE*	PA (JÓS READ	CHANGE*	He L	200	CHANGE	The make and	(mV)	Charles of the large	TU)	Rate (ml/min)	Water (ft BMP)	Purged (ml)
Time	1 - 1		OTIMINGE		CHANGE		CHANGE		_	CHANGE	READ	CHANGE*	READ	CHANGE*		- 20	
0828	X	70.92	1	7.09		13,4	-	0.46	1		-8		>1000		leo	22-84	Ø
0833	X	21.96		7.13		13.4		9.45			3		7(000)	-	100	2z.86	500
0838	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	22.32		7.16		13.4		8.99	1		7	-	656		100	22.88	1000
	0843 X 22.49 7.16 13.3 8.68/4.21 12 439 100 22.90 100 0848 X 22.63 7.15 13.3 8.46/3.83 16 335 100 22.92 2000																
							-							-			7000
0853 X 2278 7.15 13.3 8.09/3.72 20 251 100 22.93 2000														2500			
0858 X 22.88 7.16 13.2 7.78/3.63 23 206 100 22.94														3000			
0903		22.98		7.15		13.2		7.55			25		187		100	2294	3500
908	X	23.04		7.15		13.1		_	1444		28		152		100	22.94	4000
0913	X	23.12		7,13		13.0		7.09			30		134		100	22.94	4200
0918	X	23.15	,	7.14	,	13.0		6.88			31		140		100	27.94	5000
0923	X	2723		7.13		12.9		6.71	/3.43	V	33	V	130		100	72.94	5500
0930	X	STYS	LI HATTO	7		•)	760		
														-	DE 5.1	2117	
		NW - 0	12D-Z	017017	Duplicate ID	: ==			-33		QA/QC Sam					COC Time:	
Sa	mple C Materi	ontainer					N E U	-							; PE=polyethyl	lene; O≃Other	(Specify)
Number	Code	8/ 12/2 1	me Pre	servative	Intended A	Analysis and/	or Method	Comm		tamination:	- TO 100	Field Filtered		COC Numbe			
	0000	7 70.5		001101110	WILLIADO F	andrysis and	or method	Comm	ieilis.	Ferrou	Fron	0.00 : 60.03	mxIL		ground	lugter	27
1.14.										Sulf	SV.	0.03	will		101	or:	4 ellor-
NE	27	To-	Situ Cr	T.[.	Samo	ling 1	ret .			000(1400		יינרי		_		, duces!
				, A	4	1	, ,	1		7	10		•				clarky
MINIOLOATO	D DAD	AMETERO	HAVE CTAR	וזרט איי יי	N O CONCE	OUTUE	TARINGS		ature(s):						- 1	
			HAVE STABL Specific (ladau D-	0	. 400/ 5	n Dinnet				
T 0.1 101	PAT 14	- 0 /0 IUI	Opecilio (Somulel	vity dilu l	emhaigr	uic, I	O HILL	ior H	euux Po	tenual;	± 10% (C	NISSOL IC	vea Uxyg	en and Tu	rpidity	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



TETRA TECH

LOW ELOW CROUNDWATER CANDI

Page _/ of /

	200	28		118			UN GR		VAIER	SAMPL	ING LO	G		N	IERT, Henders	son, NV Proje
Task Name			emina sta		Task Manag	jer: Arul	Ayya	sun		Task No: /	412				TMU-03	
Field Samp		Jesse Bur	ders , Po	nel Kee	ady		•			Recorded b	y: Jesse	Bunkers		Date:	5/17/17	
		24.3		istance AGS	3 7		Well Depth ((ft BMP); -			pen Interval T		19	(ft BGS)		(ft BM
Well Diame		2	PID/F	ID Readings	Beneath Inner	Сар (ррт с	7	_		Screened/C	pen Interval 8	ottom:	24	(ft BGS)		(ft BM
Pump and	Tubing T	ype: ¿Eī	Bladde 1	1/4" HDF			-	Depth: >		(ft BGS)	23		(ft BMP)	MP Descripti	ion: To c	
Equipment			* Alconox	, DIR.	ne		Depth to Wa	iter Before Pu	ımp Installatio	n (ft BMP):	22.40	Time: 6	1833	GW Disposa		
	PURGING	T	emp. (°C)		pH Units)	and the second	nductivity 6/cm)	TOTAL SECTION SECTION S.	d Oxygen mg/L)		Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	2 3	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0857	V	20.79		6.68		10.1		8.16		244		2.0		80	2841	500
0902	/	20.81		6.80		10.1		7.53		211		1.6		80	22.41	750
0907	/	20.70		6.86		10.1		7.16		194		1.4		80	22.41	1000
0912	V	20.77		6.80		10.1		6.63		182		1.2		80	22.41	1300
0917	/	20.80		6.89		(0.1		6.22		173		1.1	 	80	22.41	1800
0922	V	20.75		7.57		10.1		5.86		165		1.2	 	80	22.41	2100
0927	/	20.84		7.48		10.1		536		156		1.0		80	22.41	2400
0932	/	20.87		7.65		10.1		5.09		152		1.0		80	22.41	2800
0937	/	20.89		7.36		10. (484		148		1.0		80	22.41	3100
0942	1	20.41		7.42		10.1		4.80		147		1.0		80	22.41	3500
0947	V	20.91		7.40		10.1		4.75		145		1.0		80	27.41	3900
1						10.1				1113		1, 0			12.71	3700
											-			K1/7	1/2	
														51)		
		W 035-2	0170517		Duplicate ID:					QA/QC Sam	ples/ID:		- 2-		COC Time: 0	1460
Sa		ontainer			规制设	Chan L	STEEL STEEL	Material Co				Glass; CG =	Clear Glass:	PE=polyethyle	ene; O=Other (S	Specify)
Number	Materi	100	ma Day		1-1			Field Decor	lamination:	Y N	Field Filtered:	YN	COC Number			100.17)
Marine	Code	Volul	ile Pre	servative	intended A	nalysis and/	or Method	Comments:	Ferron	s Iron:	0.00			0.1-	uch .	1/
1/		_						ł	54	Fide :	08			ground	olor.	ellow
	I/LT	In-	situ 5	ampline	Set]								
				7')						- /						
III I I I I I I I I I I I I I I I I I								Signature(s):	she						
+ 0.1 for	R PARA	METERS F	IAVE STABLI	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:					Ni li		7	
BGS.	Relow C	Eround Surfa	Specific C	Continued	rv and Te	mperatur	e: ±10 r	nv for Re	dox Poter	ntial: ±	10% for D	ssolved	Oxygen a	ind Turbic	lity	

BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page / of /

					<u>L</u>	OW FL	OW GR	OUNDV	NATER	SAMPI	LING LC)G		N	ERT, Hender	son, NV Proje
Task Name			Minn Study		Task Manaç	ger: Arul	Ayya	Swami		Task No:	MIZ				[MW:03D	
Field Samp			Kers Dan		y					Recorded b	oy: Josse	Bunkers	f	Date: 5/	17/17	
Well Depth				istance AGS	1 /		Well Depth ((ft BMP):	49.10		Open Interval T		4	(ft BGS)	<u></u>	(ft BMI
Well Diame			PID/FI	ID Readings i	Beneath Inner	r Cap (ppm c					Open Interval B		9	(ft BGS)		(ft BM
Fourinment	Decem	ype: QED 9	Sungle Pro Bla	idder/ 1/4	i" HDPE			e Depth: 4		(ft BGS)	41.		(ft BMP)	MP Descripti		
Ednibuseur			Alconox, 1					- Interest	ump Installatio	n (ft BMP):	22.60	Time:	1112	GW Disposal	1: GW11	
	PURGING	WELLS	(*C)	(pH	pH Units)	(us	onductivity S/cm)	DO (ed Oxygen (mg/L)		Potential P (mV)	1014 - 24 - 1	rbidity VTU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	1515		CHANGE*	READ	CHANGE*		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1156	V	25.37		8.63	-	10.3		3.22		181		2.1		120	22.45	300
1201	V	23,51		8.67	ļ '	10.4		3.07		177		1.5		120	22.62	700
1206		22.94		8.69		10.4		3.61		173		1.0		120	22.62	0051
	1209 / 27.83 8.70 10.4 4.25 170 0.9 170 22.62 2000															
12 14 \ 7 27.67 \ 8.71 \ 10.5 \ 4.28 \ 168 \ 0.6 \ 1															22.62	2900
1219	V	22.65		8.71		167		0.8		120	22.62	3600				
						ļ										
	1-1-	!	<u> </u>													
	1		/										10			
	1-1-											/ /	17-17			1
									-			7000	17-17			
						\						d				7
																-1
												-				
		1-030-2019	70517	- 101	Duplicate ID:					QA/QC Sam	ples/ID: CT/	1W-031) =	20170517/	75/MSD	COC Time:	1220
58	Materi	Container	_		Share and the same			Material Co	odes: VOA = 40	0 ml glass via	al; AG =Amber	Glass; CG =	-Clear Glass;	PE=polyethyle	ene; O=Other (S	Specify)
Number	Code	CORP.	me Pre	servative	Intended /	Analysis and/	or Method	Field Decon Comments:	ntamination:	YN	Field Filtered:		COC Number			
				1	IIIOIIGG .	World and Char	DI MCHIOT	Comments:	Lem	aul tr	an: 0.	00 h	. Ji	Stand	alex	
4/E	RT	/n·5,	ita Sar	npling	Set						. 0.0	17	./L	C	water ye	llow
INDICATOR	R PAR/	AMETERS H	HAVE STABLIZ	ZED WHEN	3 CONSEC	UTIVE REA	ADINGS ARE	WITHIN	s): 150	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						- 10
PCC.	Dalami	± 3/0 IOF 4	Specific Co	onductivi	cy and le	mperatur	re: ± 10 r	ny for Re	dox Poter	ıtial: ±	10% for D	issolved	Oxygen a	and Turbid	lity	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



De_1 ot_(

NERT, Henderson, NV Project

	_			-				- 2/3			13.5	117.75				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Task Name:	4	-517	Treatab	ンピノイバ	Task Manag	jer: Arul	AUYNIV	Varri		Task No:	M12			Well ID:	-WMIT	045
гівій Батіріі	ers:) I Kena	7				41			Recorded b	y: D.Keo	idu		Date: 5	-17-17	*
Well Depth (MP Di	stance AGS	(ft):		Well Depth	(ft BMP):	24.00		pen Interval T			(ft BGS)	10	(ft BMP)
Well Diamet	er (in)	2	PID/FI	D Readings	Beneath Inne	r Cap (ppm c	ge akb):			Screened/O	pen Interval E	Bottom:		(ft BGS)	24	ft BMP)
Pump and T	ubing	Type: 🐧 🖼	Sampilro	(bladler)	iah.	tibu	Pump Intake	e Depth: -		(ft BGS)		23.00	(ft BMP)	MP Descripti		
Equipment D	econ)	Method: 3	bicket 1	rivise w	Liguno)	0	Depth to Wa	ater Before Pu	mp Installatio	on (ft BMP):	22.7	Time:	1140	GW Disposal		11 Pond
			Temp.		Н		nductivity		d Oxygen	7	-		-			
	SIN SIN SIN SIN SIN SIN SIN SIN SIN SIN	Z	(°C)		Units)	M/(AS		Heat 99(the state of the s		Potential (mV)		oidity TU)	Purge	Depth to	Cum. Vol.
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Rate (ml/min)	(ft BMP)	Purged (ml)
		1			OTTAINGE		OTANGE				CHANGE		CHANGE			
1156	X	2549		6.59	-	10.6		6,74/1.96		22		5).3		190	22.72	\mathscr{A}
1201		25.72		6.60		10.6		5.91/1.25		10		48.1		100	22.74	500
1206	X	25.77		6.62		10.6		559/1-21		-5		46.3		100	22.76	1000
1211	X	25.85		6.67		10.6		5.40/1.19		-11	/	47.2		100	22.78	1500
1216	X	75.85	V	6.68		10.6	V	5.32/1.16	V	-12	V	47.4	V	100	22.80	2000
1230								1000						140		
	1230 X STABILIZATION															
1																
	1 17-17															
-		-									//5	611				
							<u> </u>				LE					
				/							(D)					
														-		
	1															
							-				-					
Sample ID:	7	miol -0	45-2017	277	Duplicate ID				3	QA/QC Sam	nloc/ID:				COC Time:	72-
	mple	Container	7017	03/7	- upirodito 12	AL BEAU		Material Co.				r Glass CG	-Clear Glace		ene; O=Other	230
PERIODI)		erial							itamination:		Field Filtered		COC Numbe		ene, O=Omer	(Specify)
Number	Co	de Vol	ume Pre	servative	Intended /	Analysis and/	or Method	Comments:		51	-		iii			
									FARRA	us Iro	n: 0.1	17mm/	1- gro	undusto		thy docay
									Cil	LY	0.17	mal		color	, Mo (celor
NE		Ln-	271 CC.	t.s. 1	Same In	x Cet			Mary [].	wat.	m J v Ca	الما والم	duar	man.	5/3/K	they doed
	•		,		50, 4.0.			" "	T	דיג ץ	may it in	my we cen	War ng	ית ואימון ה	(non)	7
								Signature(s):	14						0:0
			HAVE STABL							()						
± U.1 for	pH;	± 3% fc	r Specific (r Dissolv	ed Oxyg	en and Tu	rbidity	
BGS -	Relo	v Ground Sur	1ace	C - Centigrad	le	GS - Grou	nd Surface	ma/L - millin	ram/Liter	min - Minu	to I	MP - Maseuri	ing Point	777	OA - Quality A	ceumnee

BGS - Below Ground Surface BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surfaction

mg/L - milligram/Lite mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units



NERT, Henderson, NV Project

Task Name			Treated			er. An	LAYYA	warm		Task No:	MI			Well ID: (TMW-	04D
Field Sampl		> Keed	y. J. B.	nber	1						r. Rke		Burber		17.0	
Well Depth (-	slance AGS			Well Depth (HBMP): 48	2.99		pen Interval T	-		(It BGS)	34	(it BMP)
Well Diamet	ier (in):	7	/ 1. (2)	U Headings	Beneath Inner	Cap (ppm c	T			the state of the last	pen Interval E			(tt BGS)	49	(It BMP)
Furnip and 1	Decen 1	pe: QQ	Surple Ft	OLIVAL	1) POWY	المراج	Pump Intake			(It BGS)	41	.50		MP Description	The second secon	T
Equipment		The second second second	achet no	ate M	1/4mx	0		ler Belore Pump	p Installatio	n (N BMP):	22-88	Time: 1	27 <u>0</u>	GW Disposal	6W-	M fond
	PURGING	Т	emp. ('C)		oH Units)	Spec Co	nductivity /cm)	Dissolved (g/L)	1	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	2 8	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE'	READ	CHANGE*	READ	CHANGE*	(mVmin)	(It BMP)	(ml)
1536	X	26.92		8.73		11.8		1.33		158		92.0		100	23.10	Ø
[34]	X	25.94	1000	8.69		122		0.671.68		172		93.6		100	23.10	500
1346	X	25.64		8.69		12.3		0.461.27		174		79.6		100	23.10	6000
1351	X	25.37		8.70		12.4		0.3511.00		78		67.3		100	73.10	1500
	1356 X 24.86 8.70 12.3 030/0.99 181 46.6 100 23.60 2000															
	1401 X 24.33 8.71 12.3 0.22/0.77 182 37:1 100 23.10 8500															
1406	1406 X 23.95 9.71 12.4 0.18/08 183 23.5 100 23.10 200															
1416	X	23.42		8.71		12.4	5	0.13 0.7		[85		13.7	1	100	23, b	4000
1416	V		LISST			16:1		O.IT O.61		107		12.1		100	0), 10	COOL
1.00	1-1-	2 WIE	ULZPITI	310											-	
1	1	1		1							1					~~
1	11	/		1							1				2700	It-
	1	1							-			-		- XX	1	
-								+								
Sample ID:	1711	r olin a	0170517-	63	Dunlicate ID	C TAN I	AUN-TAIT	0517-FD		04/00 5	ples/ID:					14
		ontainer	יו זכטוזם,		Copilcate ID	CIPID	10-2017	Material Code:			7		-Close Glace	· DE_polyothyl	COC Time: /	430
	Materi							Field Decontar			Field Fillered		COC Numbe		ene, o=omer	(apecily)
Number	Code	Volur	me Pre:	servative	Intended A	malysis and/	or Method									22
							2 77		atter 1	corous	Iron: (D.07~	yll	amende	rater	ellow zorce
KIT	10+	C	1/2-	C	-	Ca	_			Sutitle	. 9. (31 mg	11 0	Color	- ! Y.	elou ne
1/15	177	OW	up ling	- 261	tor	KICNI	JU		~	01		U	•		′	D. Ca
	-	-	1			To		Signature(s)	1	12-6						ļ
INDICATO	A PAR	AMETERS	HAVE STABL	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS A				A					
								0 mv for Re	dox Po	tential:	± 10% fc	r Dissol	ved Oxva	en and Tu	rbidity	
		Ground Surla		C - Centigra			nd Suriace	mg/L ∙ milligrar		min - Minu		MP - Measin	574 575		DA - Onality A	ELICADOR

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

mi - milliliter

NTU - Nephelometric Units

QC - Quality Control



WELL WATER LEVEL MEASUREMENT LOG

Page 1 of 1

NERT, Henderson, NV Project

Performance Injection montal Date: 5/ 5/31 Task Name: In -5.44 (Task No: Task Manager Mike Creus Fi Equipment Model/Type: Solinst Interface Meter Model 122 Jeff Richeso Field Sampler(s): Last Calibration Date: 287934

						<u> </u>	
	Well Identification	Measuring Point (MP)	Time (hrs)	Depth to Static Water Level (ft BMP)	Well-Sounding Depth Dep (ft BMP) Pro	th to Condition	n of Well and ell Seal
	CTIW-01S	TOC	0846	22.16	22.16PN	G∞d	
	CTIW-01D	TOC	0849	22.36 2		Good	
	CTIW-025	Toc	0854	22.37€	-22-3.7	Good	
20,	CTIW-02D	TOC	0856	23.9/2	72.00		A product
	CTIW-035	TOC	0858	22.51 €	-22-51	Grad	
3-	CTIM-03D	TOC	0900	23.64	23.43	Good	* Product
1	CTMW-028	TOC	0903	22.85	23.43 -22-85 AV	Good	
	CTMW-02D	TOC	0904	23.08			
	CTMW-01S	TOC	0907	22.28		Good	
_	CTMW-01D	TOC	0908	22.46		- u =	
	CTMW-03S	Toc	0910	22.47		Good	
_	CTM W-03D	TOC	0911	22.58			
	CTMW-045	ToG	0912	22.69		Good	
	CTMW-04D	TOC	0913	22.86		1/	
_							
_							
_							
	·········						
_							
_							
_							
_							
_							
_							
_							
_							
_							
-							
_							
_							

11		177 1 1	CII			014/51	0147.00	0141014							. 45	90 <u>11</u> 01 <u>1</u>
<u></u>					L	OW FL	OW GR	DUNDN	VATER	SAMPL	.ING LC)G	112	N	ERT, Henders	on, NV Proje
Task Name					Task Manag	ger: mik	e Crew	5/A10	1/A.	Task No:	elfolma			Well ID:	TMW-0	1.5
Field Samp		Riche					27%				y: J. R.				31/17	
Well Depth				stance AGS (-		ft BMP): 2	3.78	Screened/O	pen Interval T	ор:		(ft BGS)	19	(ft BM
Well Diame					Beneath Inne					Screened/O	pen Interval E	otiom:		(ft BGS)	24	(ft BM
			Sample P				Pump Intake			(ft BGS)			(ft BMP)	MP Description	on: 700	-
Equipment			Sucket ru	150 W/1	iguinox		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	22 28	Time:	0900	GW Disposal	: 6W-11	fond
	PURGING	To	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turi	bidity	Purge	Depth to	Cum. Vol.
T-A	집		(°C)	(pH	Units)	ms tus	/cm)	DO (i	mg/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time	S P	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1190		31,17		6,22		10.7		4,98		-/41		23.6		200 11	22,28	0
1105	X	29,01		6,14		11.0		4,27		-144		19.8		1/2	in 22,92	
1110	X	28,79		6.18		11.2		1.63		-147		19.6	1		-22,94	
1115	X	28.74		6,13		11.5		1.15		-146	-	18.0		900	//	36
1120	X	28.39		6.10		11.2		1,21		-150			-		22.95	<u> </u>
1125	X	28,57		6,10		1110		1,15	i 	-153		14,7	-	200	22,95	72
1130	1 1 1	28.65		6,12		111		1115				12.4	 	200	22. 94	
1135	1									- 155		9,7			22,96	_
		28.59		6110		11.5		1.11		-152	<u> </u>	9.4		200	22,98	
1140		78,64		6,09		1179		1.25		7157	7.0	9,2		200	22,96	8L
Sto	7.11.2	ation	-AC	hieve	9_96	gin	Sun	19/10	9 a	- 114	0					
·						/		//								
<u>. </u>																
																-
	<u> </u>											. ,				-
Sample ID:	CTM	W-019	5-2017	1531	Duplicate ID	· N	I A			QA/QC Sam	ples/ID:	VIA			COC Time:	
Sa	mple Co							Material Co	des: VOA = 4	0 ml glass via	al; AG =Ambe	r Glass; CG =			ene; O=Other (S	Specify)
Number	Materia Code	Volun	no Pro	servative	Intended	Analysis and/	as Mathad		tamination:		Field Filtered		COC Numbe			
Hamber	Code	V CHOIL	116	SCI AUTIAG	, interfaced /	anaiysis anur	DI MEINOG	Comments:	Felro	45 I	100 -	a wim	5/6,	- 1	ar co	,
415	OT	- (- 1.1			- 1		İ	Sulfi	de		2,09	water	r cle	a/ (1	plor
NE	RT	In-	5, FY C	([]	5, 5	ampli	19 54		<i>)</i>		0,03	Mg	7/L			,
							/	1		1	1	^	, —			
								Signature(:	s):	M	X.	X				
			IAVE STABLI					WITHIN:								· -
± 0.1 for	<u>pH: :</u>	3% for	Specific C	onductiv	itv and Te	mperatu	re: ± 10	mv for Re	dox Pote	ntial: ±	10% for C	<u> Dissolved</u>	Oxvaen	and Turbic	lity	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

NERT, Henderson, NV Project

Task Name:	In-3	Situ C1	Treate	ability st	Jask Manag	er: Aru	IA			Task No:	11/2			Well ID:	TMW-0	
Field Sampler			Leso.	γ	7					Recorded by		FRIC	45.60		1/12/1	7
Well Depth (ft				stance AGS ((t):		Well Depth (ft BMP): 4	9,41		pen Interval T	op:		(ft BGS)	34	(ft BMP)
Well Diameter	(in):	7	PID/FI	D Readings I	Beneath Inner	Cap (ppm cg	e akb):		<u> </u>		pen Interval B		-	(ft BGS)	49	(ft BMP)
Pump and Tub	ing Typ	pe: 🕢	ED B	[add	Pr Rui	np	Pump Intake	Depth:		(ft BGS)			(ft BMP)	MP Description		
Equipment De	con. Me	ethod: 3			nsr u		Depth to Wa	ter Before Pur	mp Installation	n (ft BMP):	22,41	Time:	2908	GW Disposal		Porl
	PURGING SAMPLING	Ī	emp. (°C)	l le l	H Units)	Spec Cor (uS/	nductivity (cm)	Dissolved DO (r			Potential (mV)	Turk	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	S S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1335	X	31,15		7.46		13.5	,	1.55		-7	1	115		200	22,47	0
1340	X	2.8.71		7.36		143		1.09		. 33		71.7		200	22 69	11
1345	X	28.20		7.02		14.3		1		-17		27.8		200	73/0	11
1350	*	28,11		6,95		113		0.67		-14		10.0		300	23.10	3/
1355 27,50 6,94 14,4 0,72 -14														200	23,10	
1400	X	2145		7.01						_17		3 8				
1400 X 27.41 5,98 14.1 0.75 -16 3.8 200 23.0756 1405 X 27.41 6,98 14.3 0.80 -14 0.2 200 23.0866																
1410	X	27.37		7.00	,	14.5		0,83		-14				200	23.06	5-
Slab		zati	Δ	cher	red o	1-3-1-71	110	U.,B.				0.6		200	47.06	/
	1-1-1-	<u></u>)''\ '-\	CN-C1-V	-20-01		1-1-2				_					
	11															
				-												
								-								
				<u> </u>										·		
Sample ID:	7	1.1-01	1) - 7017	0531	Duplicate ID:	NA		1		QA/QC Sam	nloc/ID: 4	// /			COC Time:	
	ple Co	ntainer					Sec. 200 (97)	Material Cor				Glass, CG =	Clear Class		ene; O=Other (Considu)
	Materia	1	4113					Field Decon	tamination:	Y N	Field Filtered:	Y N	COC Number		ine, O-Omer (Specify)
Number	Code	Volu	me Pre	servative	Intended A	nalysis and/o	r Method	Comments:	<i>-</i>							11 ,
				4.					terror	\mathcal{O}_{1}	(0) =	0.00	7% W	sater	Ye	110W
/	VE	RT	TA-C	tu /	c-1	5			Sulf	ide.	- 0.	00 mg	1/2	Colo	(llow
		 ` 		.,,,	<u></u>	100					•	. ,		Caro		
				59	-1-1-1	74-5	CT	Signature(s	w	1 1	R	~~				-
INDICATOR	PARAI	METERS I	IAVE STABL	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN	1	/\						
± 0.1 for p	H: ±	<u> 3% for</u>	Specific C	onductivi	itv and Te	mperatur	e: ±10	mv for Re	dox Poter	ntial: ±	10% for D	issolved	Oxvgen a	and Turbic	ditv	
BGS - B	elow G	round Surfa	ace	C - Centiorad	е	GS - Gmun	d Surface	mo/L - million	ram/l iter	min Minut		ID Manage	no Doint		OA Continue	

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

5/31

Page of

LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project Task Name: Task Manager: Aral Task No: 1 Well ID: CTMW-025 Field Samplers: Cheson Recorded by: Date: Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 23 Screened/Open Interval Top: (it BMP (ft BGS) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) (ft BMP) QED Pump and Tubing Type: Mon Soul, Pump Intake Depth: (ft BGS) 23.70 (ft BMP) MP Description: CIAST WILLOW Depth to Water Before Pump Installation (ft BMP): Equipment Decon. Method: Time: awll pu GW Disposal: Speć Conductivity SAMPLING Temp. pH Dissolved Oxygen Redox Potential **Turbidity** Purge Depth to Cum. Vol. (:C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ READ CHANGE* CHANGE* READ CHANGE* (ml/min) (ft BMP) (ml) READ CHANGE* READ CHANGE* 31.50 1116 200 31.39 1500 6.62 200 15UFFIC 29,55 0750 150 20,83 ha Samp Sample ID: (TMV-025-20170601 **Duplicate ID:** QA/QC Samples/ID: **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N COC Number: Field Filtered: Y N Number Code Volume Preservative Intended Analysis and/or Method Comments: Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxvgen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milititer

MP - Measuring Point NTU - Nephelometric Units

NERT Handerson NV Project

						, III I LC	ir and		AIL!	OAMII L	ma Le	, G		140	.ni, nenuera	son, INV Project
Task Name:	I	1-5.4	(RI	reatab	Task Manag	er; 4/	ul A	yya5h	ten/	Task No:	MIZ			Well ID:	CTMW	-020
Field Sample			richeso	200	1-5tody			/-/	,	Recorded by	Teft	Rich	esan	Date:	1/1/	7
Well Depth (f				stance AGS (ft):		Well Depth (ft BMP): 4	9.18	Screened/Or				(ft BGS)	34	(ft BMP)
Well Diamete		471	*- <i>G</i>		Beneath Inner					Screened/O				(ft BGS)	49	(ft BMP)
Pump and Tu		rpe:	99 Mon		w/ Pol		Pump Intake	Depth:		(ft BGS)			(ft BMP)	MP Descripti	on: TOC	
			Bucket					ter Before Pu	mp Installatio		23.18	Time: O	120	GW Disposal		11 Pend
										_			idity			
	2 2		emp. (°C)		H Jnits)	District and Print and	nductivity /cm)	Dissolved DO (r		Redox F		The Control of the Later Control	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
Time	<u> </u>			I NEAD	OTANGE		OTRANGE		OTINICE		OTIAITUL		Official			National Assets
0870	X	29.05		6,90		12.7		1.85		180		55.0		200	23.20	
0825	X	27,75		6.80		12.8		0.94		178		41.7		200	25.00	14
0830	835 X 37,03 6.73 13,0 0.62 175 13,3 200 26.00 3L															
	835 X 27,03 6.73 13,0 0.62 175 13,3 200 26.00 3L															
0840	8408 27,22 6.71 13.0 0,67 181 6,4 200 26,0344															
	2840x 27,22 6,71 13.0 0,67 181 6,4 200 26,0241 1845 X 27,37 6,76 13.1 0.74 173 7,0 200 25.11 51															
2503792	845 X 27,37 6.76 13.1 0.74 173 7.0 200 25.11 51 850 X 27,24 6.75 13.2 0.54 174 7.5 200 25.07 62															
	0850 X 27,24 6,75 13.2 0.54 174 7.5 200 25.07 6L															
	0850 X 27,24 6,75 13.2 0.54 174 7.5 200 25.07 66 0855 X 27,20 6,71 13.1 0.50 172 7.2 200 25.04 76															
2900_	X- -	27.24		6,73		13.1		0.55		170		7.0		200_	25,03	
0905		27,21		6.74		13, /	,	0.51		168		618	ļ	200	25,00	
09/0	X	27,20		6.74		13.1		0,52		164_		6.6		200	24,98	PC
2910	X	5+	46,11	29/19	10	chie	Ved	(a) o	910	Beg	10	San	19/1	19		
,											<u>-</u>					
				i												
Sample ID:	CTI	4W-0	20-201	70601	Duplicate II): CTMI	1-020	- 20170	601-ED	QA/QC Sam	ples/ID:				COC Time:	`
		Container		,				Material Co	des: VOA =	40 ml glass vi	al; AG =Amb	er Glass; CG	=Clear Glas	s; PE=polyethy	ylene; O=Othei	r (Specify)
17.1	Mater							Field Deco	ntamination:	Y N	Field Filtered	1: Y N	COC Numb	er:		
Number	Code	e Volu	ime Pre	eservative	Intended	Analysis and	or Method	Comments				Λ	0 M9	//		/
					. ,]	Fe.	rous	Irge	$\gamma = U$	יוןיי כט	61,00	and wa	iter,
		150	+ 1	0-51	+a (CR_				Ifide		004	/m9//	15	Yello	14.56
			1 1		1./	Sami	1/2		20	1110	=		1 11.	650	do Co	100
	110	atal	21/17	<u>5+u</u>	7	Jany	-11		\mathcal{N}	1.1	0)		٠, ر	, con con	197
			/	4 4 TO THE SAME AS TO SAME		5C+		Signature		/ /			<u>~</u>			
			HAVE STAB							a a a si a l	. 100/ 5	on Dionot	d O	van and T		
		± 3% to Ground Surf	r Specific	C - Centigra				mg/L - milli		otential; min • Mint		MP - Measu		gen and T	QA - Quality	Assumance
505	- Delow	GIOUIIG SUN	iace	o - cernidra	uc	GO - GIU	ariu Sullaut	11QL-1100	granivullei	THILL . MILLI	ILO.	IAIL - MAGGOR	my rollic		wn - wualky /	

BMP - Below Measuring Point

COC - Chain of Custody ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

TRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

	ask Name: In-S, tu CR Treatabilitask Manager, Arul AYYaswam, Task No: MI) Well ID: CTMW-035															
	17 (47)															
Field Samplers:		Jeff	Riche	500						Recorded by	1. Jef	- A	1 ches	Date:	5/1/1	7
Well Depth (ft B	GS):	-		stance AGS (f	t): —		Well Depth (ft BMP): 🔾	4,37	Screened/O	pen Interval 1	op:	-	(It BGS)	19	(ft BMP)
Well Diameter (i	in):		PID/FI	D Readings E	eneath Inner					Screened/O	pen Interval E		_	(ft BGS)	24	(It BMP)
Pump and Tubir	ng Typ	ie: 14	699 1	401500	n w/		Pump Intake			(ft BGS)	24.0		(ft BMP)	MP Descripti	<u> </u>	
Equipment Deco	on. Me	ethod: 3	Aucket	ROSE	w/ lig	unak	Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	39.4	Time: 4	1020	GW Disposa	1: 6WM	Back
C	, <u>o</u>	Te	emp.	р	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox I	Potential	Turl	bidity	Purge	Depth to	Cum. Vol.
2	SAMPLING		(°C)	(pH L	Inits)	(uS	(cm)	DO (1	mg/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time a	SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1025 X		31,15		7:30		10.7		3,70		140		32,7		100	27.46	0
1030 X	(29,0	3	6,99		19.6		1.64		177		2,4		100	22,48	500
1035 X	6	28,11		6.93		10.5		7.35	\ .	89	- 2	0,0		100	22,48	
1040 X		27,90		b. 93		10.5		1) 7		186		00		100	22,48	
10457		37.65		6,90		10.5		10		174		0.0		100	22.49	3 /
1050X	,	37.51		6.88		10.5		110		174		0.0		100	22,49	2.52
10557				6.87		· · · · · · · · · · · · · · · · · · ·		1.11		173		0,0		100	23,50	
16.		27,60		61.89		10,6		1.14								3.54
1100	-	27.63			010		00	1-1-7-		172		0,0		100	2211	3,0 4
		ters	5/9	61/12	CO (1) 11										
1100	X								<u> </u>		ļ					
	<u> </u>										ļ					
										<u> </u>	<u> </u>	,				
Sample ID: C	TM	W-035	5-20/70	2601	Duplicate IC): <i>N</i>	4			QA/QC San		1/1/	7		COC Time:	
		ontainer	618 /5 F				THE R. P.								ylene; O=Othe	r (Specify)
A CONTROL OF THE REAL PROPERTY.	Materia	mc HIII/2 ==/140							ntamination:	YN	Field Filtered	I: Y N	COC Numb	er.		
Number	Code	Volu	me Pre	servative	Intended	Analysis and/	or Method	Comments		1			-/1-	C=-110	dwal	400
NE	04	17	2-51-	. 16)			/-	ellous	110	1 = 0	00 m	91,1	Groun	- 44	τ/ Ιουί /
/ <u>/</u> /	$\Delta /$	المدا	n - > 1 [1 1.7					Sulfi	de =	0.00	0 19	//	Colar	Ye1	00
160	a t	tbi I	4,5	u d Y						1-			6	<u></u>	E0	
50	M	00	SPH					Signature	(s):		1 /	< /	\sim			
*INDICATOR			/ 1 / 11	LIZED WHE	N 3 CONSE	CUTIVE R	EADINGS A					1 -				
± 0.1 for pl										otential;	± 10% f	or Dissol	ved Oxyg	en and T	urbidity	
		Ground Surf		C - Centigrad			ind Surface	mg/L - milli		min - Mine						
BMP - B	ielow I	Measuring F	oint	COC - Chain	of Custody	ID - Identi	fication	mV - milli V	olts .	ml - millilit	ег	NTU - Neph	elometric Uni	ts	QC - Quality (Control

e <u>/</u> of <u>/</u>

				LC	IVV FLC	W GHO	איטאטנ	AILH	SAMPL	ING LC	JG		NE	RT, Henders	on, NV Project		
Task Name: 🎉 -	Stuck 1	restabilit	Ly studi	√ask Manag	ег. Д/с	11 AY)	laswa.	mı	Task No:	MI		-	(ft BGS) 34.00 (ft BMP) (ft BGS) 39.00 (ft BMP) MP Description: TOC GW Disposal: GU /I BMD Purge Rate (ml/min) (ft BMP) Cum. Vol. Purged (ml) 150 23.58 0 150 23.59 1.5 L 150 23.48 7.50 1.50 1.50 23.48 7.51 1.50 23.4				
Field Samplers:		Riche.							Recorded by	Jef	FRI	cheson	Date: 6	11/17			
Well Depth (ft BGS	j):	MP Dis	stance AGS (I	t):		Well Depth (ft BMP): 3	9,50	Screened/Op	oen Interval T	Iterval Top:						
Well Diameter (in):		PID/FII	D Readings B	eneath Inner	Cap (ppm co	je akb):			Screened/Op	oen Interval E	lottom:		(ft BGS)	39.0	(It BMP)		
Pump and Tubing	Type: Mrg	a Mons	soon w	1 poly	Tubin	Pump Intake	Depth:		(ft BGS)	37	00		MP Descripti	on: 176	2		
Equipment Decon.		Bucke	4 0	_ / / /	Ligur	Depth to Wa	ter Before Pur	mp Installatio	n (ft BMP):	22.5	g Time:	1340	GW Disposa	: GU 11 FC	brd		
ø	ÿ Te	mp.	р		Spec Co	nductivity	Dissolved	1 Oxygen	Redox F		Turk	oldity	Purge	Depth to	Cum. Vol.		
GIN	E North Country True Country Dead Country Dead Country (M/min) (ft RMP) (ml)												The state of the s				
Time 🖫	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)				
1350 X	30.09	7	7.52		10.5		1.99		272		24.8		150		0		
1355 X	28,32		7.27		195		0.56		238		0.0		150				
1400 X	27.65		7.12		10.6		0,50		233		0.0		150	23.54	1.5 L		
1405 X	27.35	,	7,20		10,7		0.53		229					33,50	3.254		
1410 X	27.46		7,17		10,6		0.56		224		l _			23.49	37		
1415 X	27.85		7.16		10,6		0.57		220		0,0						
1420 X	27,75		7,16		10.6		0.59		217		0,0		150	23.48	4.51		
1425 X	27.81		7117		10.6		0,60		215				150	23,47	5.25		
1430 X	27.85		7.18	,	10.7		0.58		213		0,0		150	23.46	64		
	met	· 5 5	10611	1200	1 (a)	14	30										
1430	X					. /											
							<u> </u>										
		·															
								U.									
Sample ID: CT/	nW-03	7-20170	601	Duplicate II	: N/	9			QA/QC Sam	ples/ID: //	15/MS	0		COC Time:	, H		
Sample	Container													/lene; O=Other	(Specify)		
ELECTRONIC PROPERTY OF THE LETTER	erial							ntamination:	<u>(Y)</u> N	Field Filtered	1: Y (N)	COC Numbe	er:	<u> </u>			
Number Co	ode Volui	me Pre	eservative	Intended	Analysis and	or Method	Comments:			100	-0	0 mg/1	100	ater e	-1		
		*,	. 0	-	TIL	/		Ferr	045	2101) - Di	a//	-	- ()	0101		
NERT	In-	5114-	CK 1	1000	91117	/		Sult	ide	= 0	() PU	711	1,	> Ye	110W		
	1 50	malic	0	LLI	1.1			1	a 10					, -	.		
514	7	<u></u>	'7 B	711(701	4	Signature	(s):_///_		_ <i>K</i> _	~~				<u> </u>		
									/								
± 0.1 for pH:	± 3% for	IDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



je __ of ___

NERT, Henderson, NV Project

															-	
Task Name:	ask Name: In-S.tu Cy Treatability Study Task Manager: Arul Ayaswam, Task No: M/2 Well ID: CTMW-045															
Field Sample			cheson	1 1			'7			Recorded by	Jeff	Riche	CSON Date:		7	
Well Depth (f	BGS):		MP Dis	stance AGS (I	it): —	(Well Depth (ft BMP): 🗦	4.01	Screened/O	pen Interval T	ор: —	-	(ft BGS)	19	(ft BMP)
Well Diamete	r (in):	_2	PID/Fil	D Readings E	Beneath Inner	Cap (ppm cg	je akb):		•	Screened/O	pen Interval B	lottom: —	-	(ft BGS)	24	(it BMP)
Pump and Tu	bing Ty	pe: mego	MONSOS	m w/	Poly T	- 0.00	Pump Intake	<u> </u>	-	(ft BGS)	23.50		(ft BMP)	MP Description	on: 70 (C
Equipment D	econ. M	lethod: 3	Rucket	rise	Il lia	UIDOX	Depth to Wa	ter Before Pur	πp Installatio	n (ft BMP):	22,70	Time:	0730	GW Disposal	6W-	11 Fond
1979	ပ္ ပ္	Te	emp.	i .	H F		nductivity	Dissolved			otential	Turk	oidity	Purge	Depth to	Cum. Vol.
	PURGING SAMPLING	(°C)	(pH L	Jnits)	(uS/	cm)	DO (n	ng/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time	P &	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0740	X	28,33	3	6.46		11.2		3,94		292		134		100	22,75	Q
0745	Х	27.78		6,47		11.0		1.67		249		73.6		100	22,99	(00)
													16			
0755	755 X 71.29 6.46 11.0 1.20 21 32.7 100 23.03 4.52															
		27.36		6.47		11 1		1113		193		38.5			7301	3/
0810		1 7			,	11 1		1,45		192		39.0		1		
0415		27,40		6,47		1/17		- 11-	-6	-	10		11 -		٠,٠,٠	1730 Kg.
	-	۱ ۱	mete	3	5496	1/12		9//	T	ans	16	TN	2-2	93		
2812	0815 X CTMW-045-20170602															
-																
										ļ						
															-	
			_						1	<u> </u>						
			45-201	70602	Duplicate ID);				QA/QC Sam		VIA				
Sa	mpie C Mater	Container							des: VOA = 4 ntamination;		al; AG =Ambe				lene; O=Othe	(Specify)
Number	Code	and Lucy . 1 9	me Pre	servative	Intended	Analysis and/	or Method	Comments:		(I) IV	rieki riitetet	עניי זי	COC NUMBE	31.		
110111001	000				, mondo	a lary or o all la			e Carre			1 17	ng/		1. for	
1/1	RT	10	-5 Fu		100	atabi	1,40	1		-1) - (7,07	GIO	ane a	1	
/-U-U	-4\-1	1		/	-11-6	<u>a</u>	/-/-		sulti	de	= 0.0	7 ma//	Col	2/ =	C/6	20
<	+	184	Sam	1910	50+						R	R	\bigwedge^{A}	ittle	(10U	//
		/		/				Signature(ν /			V			
			HAVE STAB							. tambial:	. 400/ 4	ou Diocal	und O		oule laite -	
		Ground Surf	r Specific	C - Centigra				mo/l - millir				MP - Mossu		en and Tu	OA - Ouslity	Anguerango

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surfact ID - Identification

mg/L - milligram/Lite mV - milli Volts min - Minute mi - milliliter MP - Measuring Point NTU - Nephelometric Units

NERT, Henderson, NV Project

										100.00						
Task Name:	In-	situ co	Treata	bility Stan	Tesk Manag	er Ar	1/ Ayy	in.		MIZ			Well ID:	TMW-	OYD	
Field Sample	irs:	Teff	Riche	5001						Recorded by	r. Feft	- Rici	-esan	Date: (12/17	
Well Depth (I BGS):		MP Di	slance AGS (lt): ——		Well Depth ((I BMP): 4	8.99	Screened/O	pen Interval 7	ор:		(It BGS)	33 99	(It BMP)
Well Diamete	er (in):	2	PID/FI	D Readings E	Benealh Inner	Сар (ррт с	ge akb):			Screened/O	pen Interval E	lottom:		(It BGS)	48,9	9 (II BMP)
Pump and To	ubing T	Pe: Mig	10 Mons	oon w	Poly	Tubing	Pump Inlake	e Depth:	_	(ft BGS)	41		(It BMP)	MP Descripti		
Equipment C	econ. N	Aethod: 6-	3 Ructe	Loins	e in	1.91/1	Depth to Wa	iter Before Pu	ımp Installatio	n (It BMP):	<u> </u>	Time: <	2930	GW Disposa	:6W-11	Pord
	(2) S	Т	emp.	р	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox 8	Potential	Turk	idity	Purge	Depth to	Cum. Vol.
	PURGING		(.c)	(pH l	Jnits)		/cm)	100	mg/L)	ORP	(mV)	(N	ru)	Rate	Water	Purged
Time	PURGING	READ	CHANGE'	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE'	READ	CHANGE*	(mVmin)	(ft BMP)	(ml)
2940	ΧI	21,29		7.81		12,3	1	1.50		184		110		100	2,80	0 .
0945	X	29.95		7.23		12.3		0.98	,	185	<u> </u>	94,2	,	100	23,01	500
0950	×	27.83		7.13		12.3		0.79		185		81,7		100	23.03	The state of the s
	V	27,26		711		12,2		0.30		182		70		100	23.05	
1000	2	27,15		7.13				0.29		1		6.8		100	23,06	
1995	X					75'3	-	0.32		187		6,5		100	33.06	
										181		6.4				3
1010				7.12		12.4	- 11	0,34		7				100	23,06	34
1010		4	1/120		ache		Coll	CT	Samf	116 0	TMG	1-04				
1919	7	4 (TMW	-041)	- 201	7060	2							-		
				4												
						ļ									ļ	
							-									
Sample ID:	CT.	MW -	040 - 20	17040	Duplicate (D	: 1/1	A			QA/QC San	ples/ID:	Level	46	0(COC Time:	6.00
Sa		Container						Malerial C	odes: VOA =	40 ml glass v	ial; AG =Amb			s; PE=palyeth)	ylene; O=Other	(Specify)
	Mate	- 1						Field Deco	ntamination:	(Y) N	Field Filtered	: Y (N)	COC Numb	er:		
Number	Cod	e Volu	ıma Pri	eservative	Intended	Analysis and	or Method	Comments	i:				0 /	/		,
									Fell	TOUS,	Iron	= 01) mg/ 1	600	undu	10ter
l	10	RI	1	citi		7/-	tabili	.	Su	1Fidt	0	000	.(i'	ralar	ic V	ellow
	1	/ /	10-	2114	C/	11/0	TOOIL	Y	, , ,	,		0,0149	" /	Coron	7 /	
- 5	Lu.	d \/	Sam	Pling	501	_		Signature	ofe).	17			7			
INDICATO	A PAP	RAMETERS	HAVE STAR	LIZEDWHE	N 3 CONS	CUTIVE R	FADINGS A			1						
			r Specific							otential:	± 10% f	or Dissol	ved Oxvo	en and T	urbiditv	
		Ground Sur		C - Centigra			und Surface	mg/L - mill		min - Mini		MP - Measu			QA - Quality /	Assurance
		Measuring I		_	of Custody			mV - milli \	ear .	ml - mittiti			elometric Un	ils	QC - Quality	



WELL WATER LEVEL MEASUREMENT LOG

Page ___ of ___

NERT, Henderson, NV Project

Task Name: In-Situ Chromium	Task No: MIZ	Date: 6/19/17
Task Manager Arul Ayyas wam.	Field Sampler(s): Jeff Richeson	Recorded by: JEAR RICHESON
Equipment Model/Type:	Serial Number:	Last Calibration Date:
Solins + 100' IP meter		

ct	Well Identification	Measuring Point (MP)	Time (hrs)	Depth to Static Water Level (ft BMP)	Well Sounding DT Depth Produ (ft BMP)	Condition We	n of Well and ell Seal
Ì	CTIW-015	TOC	0534	22.03		Good	(black Chu
	CTIW- OID		0533	22.21		tt	liquid, not
	CTIW-025		0532	22.13		Good	
	CTIW-020		0531	22.70			
	(TIW-035		0530	22.24		6000	Black Ch
20	CTIW-03D		0529	23.3-5	23,05	u	0.20'of 0
	CTMW-015		0927	2223 24		Good	
	(TMW-01)		0528	22.48		1.4	
	(TMW-025		0525	22.75		Good	
į	CTMW-02D		0526	23.12			
	CTMW-035		0523	22.40		Good	
	(TMW-03D		0524	22.53			
	CTMW-045		0521	22.66		Good	
	(TMW-04D		0522	22.85			
	(TMW-055		0519	23.18		Good	
	(TNW- 05D		0520	23.36			
	CTMW-065		0516	23.41		G 00 A	
	(TMW-06D)		0517	23.74		/1	
							· · · · · · · · · · · · · · · · · · ·
						- 32	
				İ			
							42
					-		
					<u> </u>		



					LC	OW FLO	OW GR	OUNDY	VATER	SAMPL	ING LO	G		N	ERT, Henders	on, NV Projec
ask Name:	In-Situ C	hromium Trea	tability Study		Task Manag	er: Arul Ayya	swami			Task No: M1	12			Well ID: CTM	AW-01S	
ield Sample										Recorded by	: Jeff Richeso	n		Date: (19/17	
Vell Depth (MP Dis	stance AGS (f	t):		Well Depth (ft BMP): 23.7	8	Screened/Op	pen Interval To	op:		(ft BGS)	19	(ft BMP
Vell Diamet			PID/FI	D Readings B	eneath Inner	Сар (ррт со	je akb):	· · · · · · · · · · · · · · · · · · ·		Screened/Op	pen Interval B	ottom:		(ft BGS)	24	(ft BMP
ump and T	ubing Ty	pe: Mega Mon	soon Pump v	vith Poly Tubi	ng		Pump Intake	Depth:		(ft BGS)		23.5	(ft BMP)	MP Descripti	on: TOC	<u>.</u>
quipment C	Decon. M	ethod: 3 Buck	et Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	32.24	Time:	0527	GW Disposa	I: GW-11 Pond	
624	PURGING	Ter	np. C)		H Jnits)		nductivity 6/cm)		d Oxygen mg/L)	CHICAN MORE REAL AND A STATE OF	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0640	KI	30.69		6.35		137		0.95		-91		1000		200	23,23	0
0645	X	30.80		6,20		13.9		0.75		-122		459		200	22,30	14
9650		30,82		6.20		13.8		0,58		-125		459		200		aL
0655		30,90		6.21		13.8		0.56		-124		462		200	22,31	3/
0700	18 21			6.19		- 1	†	" - V_		-126		458		200	22,32	
	- 0	1				13.9		0,55		-17		455		200	27'3/	51
0705	- -	30.95	- 2 (6,20	-1-1	- h- /- l	/	7		10/-		777		alv.v.	221) [
	 	rate	2met	15	Stab	1/126		+	70.5	<u> </u>		<u> </u>			-	
0705		Coll	ect_	Sam P	16 6	TMW	-015-	2017	76-1-7-	ļ						
									-	<u> </u>	ļ <u>. </u>		<u> </u>			
									ļ		<u> </u>		-			
										47.			ļ			
					L											
							1.0					,				act.
ample ID:	CTA	1W-015	- 2017	20619	Duplicate ID): /	VIA			QA/QC Sam	ples/ID:	NA			COC Time:	0705
S		ontainer											=Clear Glass	PE=polyethy	lene; O=Other (Specify)
	Mater	ial						Field Deco	ontamination:	(Y) N	Field Filtered	1: Y (N)	COC Numb	er:	_	
Number	Code	e Volum	e Pre	eservative	Intended	Analysis and	Vor Method	Comments	S:		mg//					
							1		Ferrous Iron	0.EO = 1 2010	11/2					
-Situ Ch	romium	Treatability	/ Study Sa	mpling Boti	le Set	l	1		Sullide =	0,081	mg//					
	-				ļ				Groundwate	reolorie /	noct K	cov.	1 cha	ng ada	of so	1
	-	_						Signature	olouluwale	A COIOLIS	R	rey h	1/ 2110	1 0001	of fer	menting
NDICATO	ם פאם בור	<u> </u>	AVE STADI	IZED WHE	I 3 CONSE	CLITIVE RE	ADINGS AD		101.	/ "						
		± 3% for							edox Pot	· ential· -	+ 10% for	Dissolve	d Oxvaen	and Turb	idity	
		Consumal Confee					und Cudana								OA - Ouality A	



					L	JVV FL(JW GH	ויעאטט	AICH	SAMPL	.IIVG LU	/G		NE	ERT, Henders	son, NV Project
Task Name:	In-Situ C	hromium Tr	eatability Study	1	Task Manag	er: Arul Ayya:	swami			Task No: M	12					
Field Sample	rs: Jeff I	Richeson			·					Recorded b	y: Jeff Richeso	วก		Date: 6	119/17	
Well Depth (t BGS):		MP Di	stance AGS (it):		Well Depth (ft BMP): 49.4	1	Screened/C	pen Interval T	ор:		(ft BGS)	34	4 (ft BMP)
Well Diamet	er (in):		PID/FI	D Readings E	leneath Inner	Cap (ppm cg	e akb):			Screened/C	pen Interval B	ottom:		(ft BGS)	49	9 (ft BMP)
Pump and T	ubing Ty	pe: QED Sai	mple Pro with I	Poly Tubing			Pump Intake	Depth:		(ft BGS)		41.5	(ft BMP)	MP Description	on: TOC	
Equipment C	econ. M	ethod: 3 Bu	cket Rinse with	Liquinox	•		Depth to Wa	ter Before Pu	mp Installation	n (ft BMP):	22,48	Time: ç	528	GW Disposal	: GW-11 Pond	
	PURGING	T	emp. (°C)		H Jnits)		nductivity /cm)			Company of the Compan				Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1810	X	30.03		7.47		12,6	<u> </u>	4,70		-90		60,1		200	22.46	0
0815	X	29.01		7.24		13.1		3.60		- 94		23,6		1	22,49	14
0820	X	28,70		7.03		13.5				-102				200	7//	26
0825	 	27,98		6.93		13.4		+/		-119		7.1		200	1 - 1	34
_0830	4. 0	27,59		6.87		13,7				-132		4.5		200		46
0835	X	28.12		6,91		13.8		0.7.4		-12		ü.I		1	T - 1	54
0849		28,29		6.87		13.9		0, 15				41		I	1	bL
0845	X	26.40		6.88		14,0		0.47		- 130		40				フム
0850	X	28,49		6.95		13.9				-133		1 17 1		1 * -	-1	84
0855	 	28.55		6,97		14,0										
4411		1 *	ramer	7	Stal	11/12	201	1	055	-1		1.1.5.3.				
0856	 x	Co		Sam	0/0	TM	4/ -0/	7 -2		119	115	Ins	2			
9855		09	11001	1	7		01	2_0		B / /	1 2 2 2					
	 -										<u> </u>					\
		ļ					<u> </u>							 	i	
Sample ID:	17	1 141-/ 01	D-20170	110	: Duplicate ID	: 1/1	14		.!	QA/QC Sar	nples/ID:	nSuco	CTMW	-010-201	ZCOC Time:	0855
	ample C	ontainer	0 30170	6/4		707		Material Co	Task No: M12							
11 11/1/8	Mater															
Number	Code	e Volu	ıme Pr	eservative	Intended.	Analysis and	or Method	Comments	:							_
					<u> </u>		,		Ferrous Iron	= 0,00	mgii					
In-Situ Ch	romium	Treatabil	ity Study Sa	mpling Bott	le Set	<u></u>	<u> </u>		Sulfide =	0,00	m9/1					
	ļ											,				
					<u> </u>			Signaturo	Groundwate	r color is	70117					
*INDICATO	P PAR	AMETERS	<u> </u>	IZED WHEI	U3 CONSEC	CUTIVE RE	ADINGS AR		(0).	-/-/						
									edox Pote	ential:	± 10% for	Dissolve	d Oxvaen	and Turb	idity	

TETRA TECH

LOW FLOW GROUNDWATER SAMPLING LOG

DT Handaroon NV Project

					L	JVV FL	JW GNG	ויעווטע	MIEN	SAIVIFL	.ING LO	<u> </u>				on, NV Project
Task Name:	In-Situ C	hromium Tr	eatability Study	100	Task Manag	er: Arul Ayya	swami			Task No: M	12			Well ID: CTM		
Field Sample										Recorded b	y: Jeff Richeso	n		Date: 6 /	20/17	
Well Depth (f			MP Di	stance AGS (ft):		Well Depth (ft BMP): 23.77	7	Oxygen Redox Potential ORP (mV) (N CHANGE' READ CHANGE' READ -64 533 -150 350 -145 239				(ft BGS)	19	
Well Diamete			PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	je akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	24	(ft BMP)
Pump and Tu		pe: Hand Ba	ailer	8			Pump Intake	Depth:		(ft BGS)			(ft BMP)	MP Description	on: TOC	
			cket Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	22.75	Time:	420	GW Disposal	: GW-11 Pond	
					Н	Spec Co	nductivity	Discolve	d Ovvden	Redox	Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
	S S		emp. (°C)		Jnits)	The second second	/cm)		mg/L)				ITU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*			READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
	1 - 1	31,26						1.17		-64		< 7.	3	Hazel	22,75	
0435				7,01		10,6	-			lane land	·			Bailer	23,40	11
0440		29.2		6.83		10,5		0,60	,		=======================================			1	13,73	7 (
2445		27, 7	<u>'b</u>	6,76		19.5		0.56			4	201	-		od 2117	<u> </u>
	<u> </u>								/	1419			 	<u> </u>		
		A	1100	X	1 ch	019	6	eto	re	5010	79/1	17.9	-			
0500		()	offec	/ (TM	4-0	25-	2017	062							
												ļ				
	 															
		 														
		-						<u> </u>	10							
				<u> </u>	 	<u> </u>	<u> </u>			6)						
		-		<u> </u>		<u> </u>	 	ļ			-		-			
	<u> </u>	ļ			<u> </u>	ļ <u> </u>					 	 				<u> </u>
																
			<u> </u>				<u> </u>				<u> </u>	1 / 1	<u> </u>			<i>p</i> 2 -
Sample ID:	CTI	4 -	025-20	17062	2Duplicate II); /V	TA			QA/QC Sar		NA		55 1 41 1	COC Time:	~ ~
Sa	• •	Container													ene; O=Other (Specify)
	Mater				[_1	A a al vala a a a	l/or tilathed		ntamination:	(Y)N	Field Filtered	3: Y UN)_	COC Numb	er:		
Number	Code	e I Vol	ume Pr	eservative	Intended	Analysis and	vor metriod	Comments	S: Engrava Iran	- 01	20 mg	7/(
1. 01. 01	l	. Tue -1-1-1	lia Cando Ca	line Dat	tle Cet		т	<u> </u>	Cultido =	1= 0.	30 mg	1				
in-Situ Chi	romiun	n Freatabl	lity Study Sa	mpling bot	lie Ser	<u> </u>	J	-	Sullide =	011	o pring	' ' /				
								11	Groundwate	er color is	slight	14 6	-ex			
								Signature	ologijanak ole):	P1		'/ @ '	• • /			
ANDICATO	D DAD	AMETERS	HAVE STAB	IZED WAS	N 3 CONSE	CLITIVE DE	ADINGS AD		/(a)·		/-//				-	
INDICATO	M CAM	AIVI⊏ I EMO - 1 29/ 5 -	r Specific	Conduction	T bne viiv	'amnereti		my for P	edox Pot	ential:	+ 10% for	Dissolve	d Oxvaer	and Turb	iditv	
			food												QA - Quality A	Assurance



IC					LC	OW FLO	OW GRO	DUNDW	ATER	SAMPL	ING LO	G		NE	RT, Henders	on, NV Project
Task Name:	In-Situ C	hromium Trea	tability Study		Task Manage	er: Arul Ayya	swami			Task No: M1	2			Well ID: CTM		
Field Sample	rs: Jeff F	Richeson								Recorded by	: Jeff Richeso	n	_	Date: 6	119/17	
Well Depth (f	t BGS):		MP Dis	stance AGS (f	t):		Well Depth (f	it BMP); 49.18	3	· · · · · ·	oen Interval T			(ft BGS)	34	
Well Diamete	er (in):		PID/FII	D Readings B	eneath Inner	Cap (ppm cg				Screened/Op	oen Interval B	ottom:	<u> </u>	(ft BGS)	49	(ft BMP)
		pe: QED Samp	<u> </u>		tubing		Pump Intake	<u>-</u>		(ft BGS)		41	(ft BMP)	MP Description		
Equipment D	econ. Me	ethod: 3 Buck	et Rinse with	Liquinox			Depth to Wat	ter Before Pur	np Installation	n (ft BMP):	33,12	Time: 0	526	GW Disposal	: GW-11 Pond	
	<u> </u>	Ter			Н		nductivity		d Oxygen	The second second	otential		oidity	Purge	Depth to	Cum. Vol.
	PURGING SAMPLING	(*)	7	(pH i			/cm)		ng/L)		(mV)		TU)	Rate (ml/min)	Water (ft BMP)	Purged (ml)
Time	<u>S</u> S		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*			
1900	X,	30.58		7.17		17.7		1.57		-9		39, [_		150	33.10	0
1005	X	28.40		7,12		12.1		1,42		-99		66.8		150	23.14	750
1010	X	27.51		6.98		12,0		0.41		-128		24.7		150_	23.14	1,5 4
1015	X	26.97		6,99		12,2		0.40		-134		13.4		150	23,15	2,25/
103-9	X	27.00		6.99		12,2		0.66		-138		10,7	ļ	150	23, 15	3.0 L
1025	X	27,70	·	6.97		12,3		011		-145		8.4		150	<u>⊃3.15</u>	3.75.4
1930	X	26,94		6,97		13.3		0.60		-145		8,4		150	23,15	4,56
1035	X	27.04		6,97		12.3		0.40		-153		7.9		150	23,/6	5,25/
1040	X	26.83		b. 97		12.4	<u> </u>	0,37		-155		7,5		150	23.16	610L
1045	X	26.73		6.97		12.4	<u> </u>	0.36		-157		7.6		150	23,17	6,754
1050	X	26,73		7,00		12.5		0.50		-153		7,3		150	23,/8	7,54
1055	X	26.71		6.97		12.5	1	0,47		-157		7,4		150	23,17	8,254
1109	X	26,62		6.97		12,5		0.44		-160	<u> </u>	7.1		150	731/8	9,04
1105	X	26,55		6.97		12.5		0:41		-161		7,2		150	23,18	9,754
1105	X		ampte	15 5	fabili	200.	Colle	ct Sa	MP/e	CTN	·		21706	19 + 0	TMW-	20-2017
Sample ID:	CTI	MW-02	7-2017	0619	Duplicate ID	CTM	M-05D					FD		/	COC Time:	1105 -
Sa		ontainer											=Clear Glass COC Number		ene; O=Other (Specify)
Number	Materi		Dr.	eservative	Intended	Analysis and	or Method	Comments	ntamination:	(Y) N	Field Filtered	i: Y (N)	TOOC MUITIDE	} r.		
Hambei	Cour	y voidii	10 170	7001741170	Intorioco	rinaryoto and	TOT INIVITION	Continuona	Ferrous Iron	= 0,00	mgl	T T				
In-Situ Ch	romium	Treatability	y Study Sai	mpling Bott	le Set				Sulfide =	0.00	mgli	1	40			
	T															
										r color is	rellow	•				1
				1700 11010	10.00000	NITE (F C C	ADIMOS AS	Signature	(s):	nj	~ / C					
		AMETERS H							odov Bot	antial:	- 109/ for	Dissalva	d Ovuges	and Turb	idity	
<u> </u>	pH:	± 3% IOI	Specific (onauctiv	ity and	emperatt	He: IIV	HIN TOLK	EUUX FOR	ential.	5 1U/0 IUI	PISSOIAE	u OXVUEI	and Turb	ICHICA	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Task Name:	In-Situ C	hromium Tre	eatability Study	25 52 154	Task Manage	er: Arul Ayyas	swarni			Task No: M	12	3 16		Well ID: CTM	IW-03S	
Field Sample		1000								Recorded b	y: Jeff Richeso	n		Date: 6	20/17	
Well Depth (i	t BGS):		MP Dis	stance AGS (I	t):		Well Depth (ft BMP): 24.35	5	Screened/C	pen Interval T	ор:		(ft BGS)	19	(ft BMP)
Well Diamete	er (in):		PID/FI	D Readings B	eneath Inner	Cap (ppm cg	e akb):			Screened/C	pen Interval B	ottom:		(ft BGS)	24	(ft BMP)
Pump and Tr	ubing Ty	pe: Mega Mo	nsoon pump w	vith poly tubin	9		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Description		
Equipment C	econ. M	ethod: 3 Bud	ket Rinse with	Liquinox	130-1010-0101		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	22.40	Time:	0515	GW Disposal	: GW-11 Pond	
	PURGING SAMPLING	Te	emp. (*C)		H Jnits)	The second second	nductivity /cm)	A STATE OF THE PARTY OF THE PAR	d Oxygen mg/L)		Potential (mV)	SHIP THE STREET, ADVAN	oldity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAM SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0530	X	126.41		6.72		11.1		1.75		5		272		200	22,40	0
0535	X	26.18		6.62		11.)		1.49		9		107		200	22,54	11
0540	X	26.21		6.62		11.3		1,03		22		111		200	22,55	ZL
0545	X	26.11		651		11.4		0.52		30		119		200	22,55	34
0550	X	26.11		6.53		11.4		2.54		32		115		200	22,53	41
05 43	2	26.25	-	6.50		11.11		2,50	,	53		94,0		200	22,56	5L
-	2	26,17		6.52		11 4		.11	-	52		97,0		200	32.56	
0690	7	,	7	6.50		11.7		0, 23		38		95 1		200	22,55	71
0605	0	26.08		6.51		11.7		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		40	-	91)		200	22,56	8L
0610	0	26,20		0 00		#3		0,21	†	34	1	88.8	-	-		91
0615	0	26.19		6151		11 3		2.4	_	-		971		200	22,57	PL
06 20	1	26,24		600		11.12		- 1	-	33		001	-	200	22,56	111
0625		36.36		6.55		11:3		0,25		33	+	84,0		200	27,26	Q.L
0630	Δ	26.2		6.53	1-1.1	1117	11	/-	2 /-	1	-2511	1	-	-	الادايات	
~ 2		Par	amete	1	tabil	1200	dt	0630	-	COL	secu,	1.00	100	195	/	
0630		5	umpic	(11			01701	120		QA/QC Sar	nnloo/ID:				COC Time:	170
		Container	5-2017	06 an	Duplicate ID);		Material Co	ndes: VOA -			or Glass: CG	=Clear Glass	PF=nolvethvi	ene; O=Other (
- 0	Mater								ntamination:		Field Filtered		COC Number		0.10, 0-0.110. (Ороспу
Number	Code		me Pre	eservative	Intended	Analysis and	or Method	Comments				1.	•			
								11	Ferrous Iron	= 0,00	o mg	//,				
In-Situ Ch	romium	Treatabili	ity Study Sa	mpling Bot	le Set		4		Sulfide =	0,00	_	9/1				561
									Groundwate	er color is	clear	3				
								Signature		ny	RA	2		185		
			HAVE STABI												* ***	
			Specific (ire: ±10					Dissolve MP - Measu		and Turb	OA - Quality A	



NERT Henderson NV Project

						/	Jii Gire	7011011	AILII						El II, licideis	
Task Name:	n-Situ C	hromium Tre	eatability Study	/	Task Manage	er: Arul Ayya	swami			Task No: M1				Well ID: CTM		
Field Sample	rs: Jeff F	Richeson								Recorded by	: Jeff Richeso	n			120/17	
Well Depth (fi	BGS):	-	MP Di	stance AGS (ft):		Well Depth (t BMP): 39.49)	<u> </u>	en Interval T			(ft BGS)	34	V/
Well Diamete	r (in):		PID/F	ID Readings 6	Beneath Inner	Cap (ppm cg	e akb):			Screened/Op	en Interval B			(ft BGS)	39	9 (ft BMP)
Pump and Tu	bing Typ	e: QED Sar	nple Pro (blad	der) with poly	tubing		Pump Intake	Depth:		(ft BGS)		37	(ft BMP)	MP Descripti		
Equipment D	econ. Me	ethod: 3 Bud	ket Rinse with	n Liquinox			Depth to Wat	ter Before Pur	mp Installatio	n (ft BMP):	37.28	Time:	0710	GW Disposa	i: GW-11 Pond	
	PURGING		emp. (*C)		oH Units)	THE RESERVE OF THE PARTY OF THE	nductivity /cm)		d Oxygen mg/L)	Redox F	otential (mV)	The second secon	bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
9715	X	27,25		18,33		10.1		1.99		-16.5		32,0		200	27.28	P
, –	X	26,72		7,79		10.1		1.50	-	-168		8,2		200	22,70	1 L_
0725		36,63		7.70	·	10.1		1,27		-175		5,4		200	22,72	1
0730		26,70		7.69		10.2		1.70		-177		5.0	1	200	22.73	36
01 19	 			710		10.2	-	1.115	<u> </u>	-178		11.7		200	22.73	41
0/35	\ \ -	26.75	 	7.68			-	1,47	·	-180		7,-		200	33.75	51
0740		26.66			ļ ———	10.2		-!-!!		100		416		200	22.75	6L
0745	A—	26.51		7,65	 	10.2		-6-1-1-6-		184		4,5		200	22,75	7/
0750	X -	26.61		7,60		10.3	1	1,23	-	-191		4.6	 	- I ···		84
0755		36.5		7,63		10.3		11-1-2	<u> </u>	-171		4-13-		200		2 - 1
0890		26,57		7.65	·	10.7	1 -1-	1.15		17-2		416	/ 2	900	22.75	-/-
		Pe	rame	ters	ach	e Vec	4 Sto	0	201		at o	2800	1-6-2	Cons	ecut.	
0809	<u> </u>	1	plect	Sal	nPIP	CTI	11W-	03D-	2017	062	P			ļ		
			<u> </u>		'					ļ					-	1
													ļ	ļ <u>.</u>		
Sample ID:	CTM	W-03	D-2017	0620	Duplicate ID): N/.	4			QA/QC Sam		NA			COC Time:	
Sa	imple C	ontainer			1 101										iene; O=Other	(Specify)
	Materi	The second secon							ntamination:	(Y) N_	Field Filtered	d: Y (N)	COC Numb	er:	_	_
Number	Code	yolu e	ıme Pı	eservative	Intended	Analysis and	Vor Method	Comments): - Former land	n= 0,00	m9/1	1				
la City Chy		Trantabil	ity Study Sa	maliaa Bat	tlo Sat	1		11	Sulfide =		/ /	ı				
in-Situ Chi	Tomiun	Treatable	ity Study 32	impling Bot		<u></u>	J	11	ounde –	0,00	Myll	Ι,				
	 								Groundwate	er color is	42/10h	V ¬				
	 							Signature		n	RA	<u>e</u>		10.0		
*INDICATO	R PAR	AMETERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AR	E WITHIN:								
± 0.1 for	:На	± 3% for	Specific	Conducti	vitv and T	emperati	<u>ure: ±10</u>	mv for R	edox Pot	ential: :	<u> 10% for</u>	Dissolve	d Oxyger	n and Turb	idity	
							and Contains								OA - Ouality /	Accurance

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control

LOW ELOW COOLINDWATED CAMPLING LOG

					L	JVV FL	JW GM	JUNDN	AIEN	SAIVIPL	.IIVG LU	u		NI	:HI, Henders	son, NV Project
Task Name:	In-Situ C	hromium Tre	eatability Study	1	Task Manag	er: Arul Ayya	swami			Task No: M	12			Well ID: CTM	IW-04S	
Field Sample			<u> </u>							Recorded by	: Jeff Richeso	n		Date: 6/	20/17	
Well Depth (ft BGS):		MP Di	stance AGS (ft):	· · · · · · · · · · · · · · · · · · ·	Well Depth (ft BMP): 24.01		Screened/O	pen Interval T	ор:		(ft BGS)	1!	9 (ft BMP)
Well Diamete	er (in):		PID/FI	D Readings E	Beneath Inner	Сар (ррт со	je akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	2-	4 (ft BMP)
Pump and To	ubing Ty	pe: Mega Mo	onsoon pump v	vith poly tubin	g		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC	
Equipment C	econ. M	ethod: 3 But	cket Rinse with	Liquinox			Depth to Wa	ter Before Pu	np Installatio	n (ft BMP):	22.66	Time:	0900	GW Disposal	: GW-11 Pond	
	PURGING SAMPLING	Te	emp. (*C)		H Units)	The second second	nductivity /cm)	The second section of the second	d Oxygen mg/L)		Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	NA NA	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
2935	12 - 21	31,00	1	6.90		10.		1.70		191		150		200	22,66	0
0940	X	30,66		6.95		19,2	,	1:42		132		125		200	a2,7/	14
0945	X	30.50		6,97		10.3		1,30		115		108		200	22,71	aL
0950		30.81	 	6.77		10.4		0,31		-78		76		200	7.7. גב	3L
0100	 	120,01		6.62		10,4		0.33		-75	 	74		200	22,75	41
9955		30.78			\					-73		1,1-	-	209	22,78	127
1000		30,42		6.88	,	19.4	 	0,35		-70			-	200	22.81	61
1005	/ /	30.45		_6,60		19.4		0.76				79		000	- 	
					ļ	· · · · · ·				<u> </u>	 					
<u></u>		-			ļ						<u> </u>					
		ļ		ļ	<u> </u>	<u> </u>	ļ				ļ			<u> </u>		l
	- 						<u> </u>				<u> </u>	**		ļ		
		-					<u> </u>					<u> </u>		ļ		
,						<u> </u>	ļ				-		1			
						-								ļ		
					<u> </u>		4.0								1	<u> </u>
Sample ID:			45-201	70620	Duplicate II); <i>[V</i>]	A	1		QA/QC San		level	4 4		COC Time:	(On mails A
S	- ' -	ontainer							ntamination:		Field Filtered		COC Numb		ene; O=Other	(Specify)
Number	Mater		ıme Pr	eservative	Intended	Analysis and	/or Method	0				1	,			<u>.</u>
Hamber	1 000	1012			I	r in cary one carre	-		Ferrous Iron	i= Ω. ⊃	< ma	/ /				
In-Situ Ch	romiuπ	Treatabili	ity Study Sa	mpling Bot	tle Set				Sulfide =	~ na	mall	' / '				
	Ï		<u> </u>							0,09	14171	[- / / /			
									Groundwate	er color is (Clea/	(5)	(ghth)	1 Gre	\forall	
								Signature	(s):	ny	· P	20/		21	/_/_	<u>-</u>
			HAVE STAB								400/ 1	D: .	.1.0		t -1ts	
		± 3% for									± 10% for			and Turb	OA Ouglitus	Annuronos

LOW FLOW GROUNDWATER SAMPLING LOG

										l=		-		MI-ILID. OTH	IW OAD	
Task Name: In-Situ			eatability Study		Task Manag	er: Arul Ayyas	wami			Task No: M1				Well ID: CTM		
Field Samplers: Je	f Ri	icheson				<u> </u>				-	: Jeff Richeso				121117	
Well Depth (ft BGS):		MP Dis	stance AGS (f	l):		Well Depth (t BMP): 48.99)		en Interval T			(ft BGS)	34	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Well Diameter (in):			PID/FI	D Readings B	eneath Inner					Screened/Op	en Interval B			(ft BGS)	49	(ft BMP)
Pump and Tubing	Гур	e: QED San	nple Pro with p	oly tubing			Pump Intake	Depth:		(ft BGS)	41	23.75	(ft BMP)	MP Description		
Equipment Decon.	Mei	thod: 3 Bud	cket Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installation	n (ft BMP):	22,55	Time: <	1435	GW Disposal	: GW-11 Pond	
Inches College	<u>o</u>	Te	emp.	р	Н	Spec Co	ductivity	Dissolve	d Oxygen	Redox F	otential	Turk	oidity	Purge	Depth to	Cum. Vol.
) Nig	2		(°C)	(pH l			/cm)		mg/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time Time	SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0500 X		28,91		9.18				1.31		2		185		200	22.86	0
0505 X	-	26.79	,	- 39		11.5		100		-34		66.8		200	22,94	14
	-	25,94		1				0.110					,	200	22,96	24
0510 X				7.76		-/ ·->		0.40	 	-5/		22,0	1		22,98	34
2515 X	\dashv	25,76		7.67		-116-	<u> </u>	0,32		-62		11/1		200		111
0520 X		25.36		7.66				0,34		-63	<u> </u>	9.4	 	200	22,99	46
05)5 X	_	25.34		7.61		11.8		0,40		-70		7,0	ļ	200	23.00	S-L
0539X		25,19	<u> </u>	7.5		11.8		0.48		-73		6.7		200	23,02	6-4
0535X		25,10		7,55		11.8		0.51		-70		6,4		2.90	23,03	7
0540X		25,04		7,53		11.8		0,48		-68		6,3		200_	23,04	
0545X		24,98	,	7.52	13	11.9		0,50	,	- 66		6.1	_	200	23,05	94_
9-7-1-7-4-1			amet.	0,5	ach	IPUPA	Sta		patie		y = 01	-	(3/	n Secu	tive 1	Ending)
action	V		Mect	San			W-0		01701		-	3		1		/-
9545			<u> </u>	7077	7-1	(-/-/-	·V - ()	700	01.7.0(2 /_						
	\dashv															
<u> </u>			<u> </u>						ļ		<u> </u>	<u> </u>		 		(4)
2 112 12		1 / 0	<u> </u>	70(71	Duplicate ID): <i>N</i> /	<u> </u>			QA/QC Sam	nlac/ID:	NA		<u> </u>	COC Time:	0545
Sample ID: CT			4D-201	1004	Duplicate IL). /V/	7	Material C	rdes: VOA = /				=Clear Glass	; PE=polyethyl		
Mai									ntamination:		Field Filtered		COC Numb		3110, 0 - 0 11.01	(
	ode		me Pre	eservative	Intended	Analysis and	or Method	Comments	:			1				
	• • •		İ					11	Ferrous Iron	= 0,00	m9/	,/				
In-Situ Chromiu	ım	Treatabili	ity Study Sa	mpling Bott	le Set				Sulfide =	= 0.00 0,00	m9/	/ /				
									Groundwate	r color is	rellan	′	7			
								Signature		ny		10				
*INDICATOR PA	RA	METERS	HAVE STABL	JZED WHE	3 CONSE	CUTIVE RE	ADINGS AR	E WITHIN:								
± 0.1 for pH:		± 3% for	Specific (Conductiv	ity and T									and Turb		<u> </u>
PGS - Bolo	on C	Secured Quef-	200	C. Contingo	ło.	GS - Grot	ind Studence	mo/L - mill	inram/Liter	min - Mini	de .	MP - Measu	rina Point		QA - Quality A	Assurance



"0					LC)WFL(JW GK(עעאטכ	AILH	SAMPL	ING LU	G		NE	RT, Henders	on, NV Project
Task Name:	In-Situ C	hromium Tre	atability Study		Task Manage	er: Arul Ayya:	swarni			Task No: M1	12			Well ID: CTM	IW-05S	<u></u>
Field Sample										Recorded by	: Jeff Richeso	n		Date: 6	21/17	
Well Depth (f	t BGS):		MP Dis	stance AGS (f	t):		Well Depth (ft BMP): 24.5		Screened/O	pen Interval To	op:		(ft BGS)		
Well Diamete	er (in):		PID/FI	D Readings B	eneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	24	4 (ft BMP)
Pump and Tu	ıbing Ty	oe: Mega Mo	nsoon pump w	ith poly tubing			Pump Intake	Depth:		(ft BGS)		23.75		MP Description		
Equipment D	econ. M	ethod: 3 Bud	ket Rinse with	Liquinox			Depth to Wa	ter Before Pur	np Installatio	n (ft BMP):	23.19	Time: 불	13 0615	GW Disposal	: GW-11 Pond	
	PURGING	Te	emp. *C)	p (pH t		144	nductivity /cm)	Dissolve DO (r		The second second	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0620	X	25.9		7.15	i	19.4		250		88		130		200	23,36	0 1L
0625	<u> </u>	25,97		7.00		19.4		1.01		93	<u> </u>	31,6		200	23.40	21
0630		30.19	7	7.04	<u> </u>	10.5		0.86	<u> </u>	100		23.1		200	23,41	37
0635 0640		26.38	<u> </u>			10,5	 			104		19.3		200	23,45	11/
0645	 	26,36	l	6.90		10,5		0,99		107		20.5	<u> </u>	300	23.46	151
-	+/			6.97				1,06		1111		19,6		200	23,44	61
0650	\ <u>\</u>	36,60	<u> </u>	6.99		10.5		1:09		113		18.7		200	23,45	-7/
0655		26.80	meter		hieve		ahili	zatio	0 (3		cutiv		iding		0655	
	 ,	A	10			MW-	055-	2017	$\alpha = 0$	CENT	641.0	77-0	20 1719	5.)-GZ	ر ـ دها	
_0655	 - 	Col	IEC/	samp/	C-/-	77/5/-	353	0.01	2001	<u></u>	 					
						<u> </u>				(i)						
		<u> </u>	<u> </u>								 					
		<u> </u>	<u> </u>								 		<u> </u>			
		<u> </u>	<u> </u>								<u> </u>					<u> </u>
Sample ID:	- 1 A	1 - 200	1 5 - 20170	131	Duplicate IC	: N	A		<u> </u>	QA/QC Sam	nples/ID:	NIA	<u> </u>	<u> </u>	COC Time:	0655
		ontainer	7-20110	PT			<u> </u>	Material Co	odes: VOA =		*	r Glass; CG	=Clear Glass;	PE=polyethyl	ene; O=Other	
	Mater		Mayer and						ntamination:		Field Filtered		COC Numbe			
Number	Code	Volu	me Pre	eservative	Intended	Analysis and	or Method	Comments			. /	1,				
						1	·		Ferrous Iron	= 0.00	m9/	/				
In-Situ Ch	romiun T	Treatabili	ity Study Sa	mpling Bott	le Set		<u> </u>		Suitide =	0,02,	m9/1					
	 								Groundwate	er color is	Volla L		•			
	+						<u></u>	Signature		my	(CIPS	M		art	<u></u>	
			HAVE STABI								7					
± 0.1 for	:Ha	± 3% for	Specific (Conductiv	<u>rity and T</u>		ire: ± 10	mv for R		ential: :		Dissolve		and Turb	idity Outlier	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control

					LC	JVV FL	JW GH	וישויטט	AICH	SAMPL	ing Lu	'G		NE	ERT, Henders	son, NV Project
Task Name:	In-Situ	Chromium T	reatability Study	/	Task Manage	er: Arul Ayya:	swami			Task No: M	12			Well ID: CTM		
Field Sampl	ers: Jeff	Richeson		<u> </u>						Recorded b	y: Jeff Richeso	n		Date: 6	121/17)
Well Depth	(ft BGS)	;	MP Di	stance AGS (ft):		Well Depth (ft BMP): 54		Screened/0	pen Interval T	ор:		(ft BGS)	34	4 (ft BMP)
Well Diamet	er (in):		PID/F	ID Readings E	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	54	4 (ft BMP)
Pump and T	ubing T	ype: QED Sa	mple Pro (blad	der) with poly	tubing		Pump Intake	Depth:		(ft BGS)		44	(ft BMP)	MP Description	on: TOC	
Equipment (Decon. N	/lethod: 3 Bi	icket Rinse with	Liquinox			Depth to Wa	ter Before Pu	np Installatio	n (ft BMP):	23.36	Time: C	730	GW Disposal	: GW-11 Pond	
	PURGING	1	emp. (°C)		H Units)	and the second second	nductivity /cm)		d Oxygen mg/L)	. The state of the	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	E S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0820		31.11		8.09		10,0		1.80		176		64.8	1	200	23 37	0
0825	 	28.1	e -	7.81		10.1		1.20		167		23.7		200	23.52	11
9530	1	27.5		7,66		10.2		1,00		157		11.		200	23,55	2/
1839	-	27,41	4	7.63		10.3.		1,55	-	151		9.1		200	23,57	3/
		27.5				10,4		1.59		148	-	8.9	·	200	23,56	11/
084				7(2		10.5	<u> </u>	1.15		11/6	 	816		200	23.57	51
		27,3		7,63		-77	 	1.59		143		8.8		200	2357	764
0850		27.3	Trong of		cl h	10,4	1		350	 			1		/	1
-00		4	amet	1/)	Stabil	1260	(a-	1	-	(3	<u>CON</u>				195	50
085	9_/	-COI	lect	Samp	16 6	TMA	1-05	11-201	7062	1 7	(1/2	9W-C	00-	20170	62/~	70
														-	ļ	<u> </u>
	-						ļ	-	ļ	ļ						
			-							1	 		ļ			
	_ _	_											ļ			
	_ _										<u> </u>		ļ			
									<u> </u>							
Sample ID:	CTI	ทพ-0	511-2017	10621	Duplicate ID	: CTM	W-050	2017063	11 - FD	QA/QC San	•	VA			COC Time:	0850
S		Container		Harian I											ene; O=Other	(Specify)
	Mate				latandad	A tractal a d	for Mathed	. —	ntamination:	(Y)N	Field Filtered	1: Y (N/	COC Numb	er:		
Number	Cod	ie i voi	ume Pr	eservative	Intended i	Analysis and	or Method	Comments	: - Forroug Iron	- 0 00	n m9	//				
In-Situ Ch	romiu	n Treatab	lity Study Sa	mpling Bot	tle Set	1	τ	1	Sulfide =	A. 00	mg/	,				
	il Ollina	II II ÇARAD	nty Otddy Oa	mpling bot	1	1	<u> </u>	-	Comidc =	00 00	7.19/	/	_			
	-										gellow		7			
	-							Signature	(s):	3/		R		9.4		
INDICATO	OR PAP	RAMETERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AR									
			r Specific						edox Pote	ential:	± 10% for	Dissolve	d Oxvaer	and Turb	iditv	
BGS	- Belov	Ground Su	rface	C - Centiora	de	GS - Grou	and Surface	ma/L - milli	oram/Liter	min - Min	ute	MP - Measu	ring Point		QA - Quality A	Assurance

BGS - Below Ground Surface BMP - Below Measuring Point

COC - Chain of Custody ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

"					LO	OW FLO	OW GRO	DUNDN	AIER	SAMPL	.ING L.C)G		NE	ERT, Henders	on, NV Projec
Task Name:	In-Situ C	hromium Tro	eatability Study	1	Task Manag	er: Arul Ayya	swami			Task No: M1	12		**	Well ID: CTM	IW-06S	
Field Sample			<u> </u>			•••			<u> </u>	Recorded by	y: Jeff Richeso	on		Date: 6/2	4/17	
Well Depth (f	t BGS):		MP Di	stance AGS (ft):	-	Well Depth (ft BMP): 24.4	1	Screened/O	pen Interval T	ор:		(ft BGS)	19	
Well Diamete	er (in):		PID/FI	D Readings E	Beneath Inner	Cap (ppm co	je akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	2	(ft BMP
Pump and Tu	ibing Ty	pe: Mega Mo	onsoon pump v	vith poly tubin	g		Pump Intake	Depth:		(ft BGS)		24		MP Description		
Equipment D	econ. M	ethod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	23.41	Time: c	945	GW Disposal	: GW-11 Pond	
	PURGING SAMPLING	Т	emp. (*C)		H Units)		nductivity (cm)	In the second se	d Oxygen mg/L)		Potential (mV)	and the state of the same of the same of	oldity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
010	X	34,50	d	6.79		9.47		1.94		-12		315		150	23.42	0
1015	X	34,21		6.76		9.60		1,25	1	-85		142		159	23,65	0.75 L
620		34.90		6.71		9,70	7	0,80		-106		268		150	23.67	1.54
1925	X	35,2		6.74		9,89		0.76		-113		263		150	23,70	2,254
1030	1			6,76	ļ	10.00		0.69		-120		25/2		150	23.70	3.06
1935		35.29	ļ	6.74	<u> </u>	10,1		0,66		-125	1	250		150	23,70	
1970		35,2	<u> </u>	017		_ <i>IV_(</i> !_	1	0100		143						
							<u> </u>			-	1			-		
		<u> </u>		···			ļ		- 14	- 						
	-				 		<u> </u>							1		
	 				<u></u>									-		<u> </u>
						 				100		ļ				<u> </u>
						 	-					ļ				
 		 				-					 					
								ļ								
		<u> </u>					14.4			21/222	A 4170	4//4			000 Times	1020
			5- 20/7	0621	Duplicate II): <u>/</u>	VIA	1 1444 146		QA/QC San	•	NA	Class Class	. DCelecthod	coc Time: ene; O=Other (1935
Si	, '	Container							odes: VOA = intamination:		Field Filtere		COC Number		ene, O=Olner	эреспу)
Number	Mater	Maria Dallanda	ime Pr	eservative	Intended	Analysis and	Vor Method	Comments		(1) 11	Theid Filterer	11	TOOO Manua	<i>y</i> 11.		
Hamber	1 000	0 1 7511							Ferrous Iror	n= 0,4	0 mg	1/,/				
In-Situ Ch	romium	Treatabil	lity Study Sa	mpling Bot	tle Set			*	Sulfide =	0,02	mg	//		<i>C</i>	enting	\
				-						•	/	. /	~~V	The CM)
								.	Groundwate	er color is 5	light	14	sce y	fruit	enting odor	/
					1	AUT. 15 C.	ADINIOS (T	Signature	e(s):	(n	71	~	~			
			HAVE STAB						adox Bat	ontial	+ 10% for	Dissolve	d Ovygon	and Turb	idity	
79.5			r Specific					mo/L - mill				MP - Measu		and Tulb	OA - Quality A	

BGS - Below Ground Surface BMP - Below Measuring Point COC - Chain of Custody

ID - Identification

mg/L - milligram/Liter mV - milli Volts

ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

10					L	OW FLO	OW GRO	OUNDY	VATER	SAMPL	.ING LC	IG .		N	ERT, Hender:	son, NV Project
Task Name:	n-Situ C	nromium Tre	eatability Stud	ly	Task Manag	er: Arul Ayya	swami			Task No. M1	12			Well ID: CTN	1W-06D	
Field Sample			<u></u>	 -						Recorded by	: Jeff Richeso	on		Date: 6/	12/17	
Well Depth (f		· · · · · · · · · · · · · · · · · · ·	MP C	istance AGS (it):		Well Depth (ft BMP): 54.2	25	Screened/O	pen Interval T	op:		(ft BGS)	3	4 (ft BMP)
Well Diamete			PID/F	ID Readings E	eneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	5	4 (ft BMP)
		e: QED San	nple Pro (blad	dder) with poly	tubing		Pump Intake	Depth:	 - :	(ft BGS)		44	(ft BMP)	MP Descripti	on: TOC	
Equipment D	econ. Me	thod: 3 Bud	ket Rinse wil	h Liquinox			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	23,75	Time:	0500	GW Disposa	: GW-11 Pond	
10.00	وای	Te	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turl	bidity	Purge	Depth to	Cum. Vol.
	NE NE		°C)		Jnits)		/cm)	CONTRACTOR OF THE PARTY OF THE	mg/L)		(mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0505	4	28.25	-	7.80		10.5		1.63		25		23,76	175	200	23,91	0
0510	1	26,26		7.36		10.8		0.71		43		20.6		200	23, 95	7L
سي سي		25.75		7		. 0		0.40		56		90.8	1	200	23.97	51
0) 12-	2-			7,28		10.7		0.35	7	67	 	34.8		200	23,94	31
02-90	\	24,99				-11-5	-					211		200	23.43	Ú
05.1)		24,9b		7,26		113		2 3 3		70_			-	200		75
0530		25.01		7.26		11.2	<u> </u>		<u> </u>	14-		16.4			- - - - 	7.1
0535	<u>X</u>	24,94		7.26		11.2	ļ	0.11			ļ	13.3		200	23.91	16C _
0540	<u> </u>	25,00		7.24		11,4		0.16		79	<u> </u>	11.5		200	23.99	1/_
9545	X	24.94		7,24		11.4		0,15		185	,	_19.5	1	200	23,98	84
0550	X	24.91		7,23		11.4		0.15		185		9,7		200	23,99	9/
		Po	Iame	1115	ac	hieve	1/_ 5	10.61	11201	100	at	CIN	14-0	760	3 1800	(195)
0550	XX		ollic	F 50,	219/8	CTA	VW-0	26D-	20170	162						///
					7											
	1															
											1					
Sample ID:	1.71	14.0/	1-201	70622	Duplicate II);	NA	<u>!</u>	1	QA/QC San	nples/ID:	NIL	1		COC Time:	0550
Sa	mple C	ontainer	7-201	21/20				Material C	odes: VOA =		*	er Glass; CG	=Clear Glass	; PE=polyethyl		
els j	Materi	-	(C)					Field Deco	ntamination:	⟨ N	Field Filtered	1: Y (N)	COC Numb	er:		
Number	Code	Volu	me P	reservative	Intended	Analysis and	/or Method	Comments		_		//				
							,]	Ferrous Iron	1= <i>O</i> ^	90 mg					
In-Situ Chi	omium	Treatabili	ity Study S	ampling Bot	tle Set	<u> </u>	<u> </u>		Sulfide = 🗸	000	m9/	/				
		_			ļ			.[]			6.1	1				
	ļ								Groundwate	er color is	tellon		^			
***********	<u> </u>	- LETERO	LIANTE CEAE	N 1355 WILL	I CONCE	OUTIVE DE	ADINOC AD	Signature	e(s):			_~		-		=
				BLIZED WHE Conductiv					eday Dat	antial	4 10% for	Nicealya	d Ovvaer	and Turb	idity	
		± 3% TOT Ground Surf		C - Centigra			und Surface	mg/L - mill		min - Min	-	MP - Measu		LAHA TAID	QA - Quality	Assurance
		Measuring F		COC - Chair	n of Custody	ID - Ident		mV - milli		ml - millili			elometric Uni	its	QC - Quality	



WELL WATER LEVEL MEASUREMENT LOG

Page	of	_
------	----	---

_	Task Name: In-Situ Chromium Treatability Study	Task No: M12	Date: 7/17/17
	Task Manager Arul Ayyaswami	Field Sampler(s): Jeff Richeson	Recorded by: Jeff Richeson
	Equipment Model/Type:	Serial Number:	Last Calibration Date:
Į			

Well Identification	Describe Measuring Point	Time (hrs)	Depth to Static Water Level (ft BMP)	Well Sounding Depth (ft BMP)	Condition of Well and Well Seal
CTIW-01S	TOC	0640	22.25	(IC DIII)	Chunky + dark
CTIW-01D	TOC	0643	22,39		Chunky Tagax
CTIW-02S	TOC	0845	22.46		Chunky + dack
CTIW-02D	TOC	0647	22.88	22.87	0,01' of oil
CTIW-03S	TOC	0649	22,69		Chunky + das
CTIW-03D	TOC	0652	23.18	23.16	0,0240001
CTMW-01S	TOC	0654	22.45		6000
CTMW-01D	TOC	0656	22.63		1
CTMW-02S	TOC	0658	22.96		
CTMW-02D	TOC	0700	23,22		
CTMW-03S	TOC	0702	22.59		
CTMW-03D	TOC	0704	22.75		
CTMW-04S	TOC	0706	22.80		
CTMW-04D	TOC	0708	23,01		
CTMW-05S	TOC	0710	23, 28		
CTMW-05D	TOC	0712	23.48	2	0,0 of 01
CTMW-06S	TOC	0714	23.	3	
CTMW-06D	TOC	9716	23.营营	1	expot of oil
					,
					•

<u></u>					, L-1	JW I L	JW GII		AILII.	SAINIFE	LIIVG LC	JG		Ni	ERT, Henders	son, NV Project
			reatability Stud	ly	Task Manag	er: Arul Ayya	iswami			Task No: M	112			Well ID: CTI	MW-01S	
Field Sample	ers: Jel	f Richeson								Recorded b	y: Jeff Riches	ол		Date: 7	120/17	7
Well Depth (istance AGS				(ft BMP): 23.7	8	Screened/O	pen Interval T	ор:		(ft BGS)		19 (ft BMP)
Well Diamet					Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	1,5	24 (ft BMP)
			lonsoon Pump		oing		Pump Intake	Depth:		(ft BGS)		23.5	(ft BMP)	MP Description	on: TOC	
Equipment E	econ. N	Method: 3 Bu	icket Rinse with	n Liquinox			Depth to Wa	iter Before Pur	np Installation	(ft BMP):	22.45	Time: C	654	GW Disposal	: GW-11 Pond	1
	၂၀၂၄	2 T	emp.		ж	Spec Co	nductivity	Dissolve	Oxvaen	Redox	Potential	Turk	idity	Purge	Depth to	Cum, Vol.
	PURGING		(°C)	(pH	Units)		/cm)	DO (r	7. 4		(mV)	1	ΓU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0750	XI	29,08	1	5.93		14.3		0,58		-49		137		100	22,45	0
0155	X	29,08		5.76		14.8		0.75		-41		69.5		100	22,56	500
0809	X	28.95		5.85	1	14,3		0.75		-111		71.7				
0805	Y	28.88	/	5.87	,	14.3		0.75		-4/				100		1000
0810	\$ -			5.93			l			-4/		71,9	79.	100	22,60	
	6	28.7	/ L -	1 - 1.1		14.3	<u> </u>	0.76		=7!	ļ	73.5	***	100	22.59	
0815	X-	28.93	l /	5.94	1-17	<i>14-14</i> ,		0.71		-40	 	74.7	5%	190	22,60	2.56
		Para	metel	5 5	101/1	200	 									2000
0815	>	Colle	ct So	m9/1	CTA	16-0	15-201	70720)							100
						_								of .	i i	
														<u>.</u>		
		1									 					
Sample ID: 4		11/2016	2-12-2	10	Duplicate ID:	NIA			l	04/00 0	ples/ID: ~	1/A		100	0007	
Sa	mole (Container	201707	*/	Dupiicate ID	70171		Material Co.					Class Class		COC Time:	0815
	Mater							Field Decon	tamination:		al, AG =Ambe Field Filtered		COC Number		ne; O=Other (Specify)
Number	Cod	1	me Pre	servative	intended A	Analysis and/o	or Method	Comments:	Carring Corn.) "	/ Incidit intered		OOC NUMBER			
								Ferrous Iron	= 0.1	9 mg	.//					-0.
	In-S	itu Chrom	ium Treatab	ility Study 9	Sampling Bo	ttle Set		Sulfide=	0.2	5 mg	1//					_
								Groundwate	r Color is 🔰	1.9641	4 610	y WI	Stro	ng od	or of	c ting form
									1		- 0	/1 /		/	Fermen	ting for
								Signature(s):		< /~	\sim				
			HAVE STABL							4						
			Specific C											and Turbic		
		Ground Surfa Measuring P		C - Centigrad COC - Chain		GS - Grour ID - Identifi		mg/L - millig mV - milli Vo		min - Minu ml - millilite		MP - Measuri NTU - Nephel			QA - Quality As QC - Quality Co	

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

QC - Quality Control

T. 1.11	1- 01					Ī= 1.44					I=				1		•
				reatability Stud	У	l ask Manag	er: Arul Ayya	iswami			Task No: M				Well ID: CT		
Field Sample			Richeson								Recorded by	y: Jeff Riches	on		Date: 7	120/17	,
Well Depth (ft BGS	3):		MP Di	stance AGS	(ft):		Well Depth (ft BMP): 49.4	1	Screened/O	pen Interval T	ор:		(ft BGS)		34 (ft BMP)
Well Diamet	er (in)	: 2		PID/FI	ID Readings	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		49 (ft BMP)
Pump and T	ubing	Тур	e: QED Sa	mple Pro with	Poly Tubing			Pump intake	Depth:		(ft BGS)		41.5	(ft BMP)	MP Descripti	on: TOC	
Equipment 0	econ.	Me	thod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	iter Before Pur	mp Installation	n (ft BMP):	22,63	Time:	6.56	GW Disposal	: GW-11 Pond	l
	m	<u>0</u>	Te	emp.		эН	Spec Co	nductivity	Dissolve	d Oxygen	Redox I	Potential		oidity	Dunes	Donath to	Cum Val
	18	들		(°C)		Units)		/cm)	1030ki sa 8 10 1	mg/L)	1,000 000 000 000 000	(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0535	X		26.82		6.84		14,4		0.63		-78		75.5		200	22,63	0
0540			26.80	,	6.75		14.5		0.68		-90		39.5		200	22.66	14
0545	1		26,79		6,66		14.7		0.70		-89		15.9		200	22.67	7 2 4
0550			26.75		6,60		14.7		0,62		-93		12.9		200	22,68	
0555			26.67		6.52		14,8		0.50		-95		8.5		200	22.69	
0600	1-1	— I	26.78	,	6.48		15.1		227	ļ- -	-110		8.0		200	22.76	50
0605	1		26.80		6.48	\ <u></u>	15.1		0,30		-113		8,2		900	22.68	- 61
9610	4		26.81		6.47		15.1		0,33		-117		8.1		200	22,69	74
0615		-	26.86		6.47		15.1		0.36		-120		7.9		200	22.68	87
V.V.!.	1		Para		-5	Stal	5/1/2	11	VI 30						200	44.00	20 -
06/5	-	ᆏ	Colli		Sami	2/-		I ————	10 - 7	2170	7.20						
			-011		Jary	77	CTN	11/-0	10-20	. 7.0	770	ニドカ					
		-	- 				(/ / / /	0	0-20	1//	120						
	-	-						<u></u>								1	
Sample ID: 4		1	101 011	1-20170	7) -	Duplicate ID	CTOOL	1-014	10170	2.2- /50	04/00 0	nla-8D.				0007	
			ntainer	1-101-10	140	Duplicate ID	. (1/90	7-410-	201707				Classi CC	Class Class	DE malumilia de	COC Time: ene; O=Other (0615
	Mat		_							ntamination: /		Field Filtered		COC Numbe		ine, O=Oliter (Specily)
Number		de	Volur	me Pre	servative	Intended /	Analysis and/	or Method	Comments:	-		/ /	1 (1)	000 11011100	••		
			Τ						Ferrous Iron	= 0.0	3 mg/	′./					
					<u></u>				Sulfide =	0.03	m9/	1					
	ln-	-Sit	u Chromi	um Treatabi	lity Study 9	Sampling B	ottle Set		Groundwate	er Color is	Ye110						
										1						•	
	<u> </u>								Signature(s):	<u> </u>	2 /		<u> </u>			
				AVE STABL							1						
				Specific C											and Turbi		
BMP	· Beloi	w G w M	round Surfa leasuring Po	ice pint	C - Centigrad COC - Chain		GS - Grour ID - Identifi		mg/L - millig mV - milli Vo		min - Minu ml - millilite		MP - Measuri NTU - Nenhel	ing Point Iometric Units		QA - Quality As	

ml - milliliter

NTU - Nephelometric Units

NERT, Henderson, NV Project

																	,
Task Name:	In-Sit	u Chi	romium Ti	reatability Stu	dy	Task Manag	er: Arul Ayy	aswami			Task No: M	112			Well ID: CT	MW-02S	
Field Sample	ers: Je	ff Ric	cheson							- :	Recorded b	y: Jeff Riches	on		Date: 7	119/17	7
Well Depth (ft BGS):			istance AGS	1 /			(ft BMP): 23.1	77	Screened/O	pen interval T	ор:		(ft BGS)		19 (ft BMP
Well Diamet	er (in):	2		PID/F	ID Readings	Beneath Inner	Cap (ppm co	ge akb):			Screened/O	pen Interval E	ottom:		(ft BGS)		24 (ft BMP
Pump and T	ubing 1	Гуре:	Hand Ba	ailer				Pump Intake	e Depth:		(ft BGS)			(ft BMP)	MP Descripti	on: TOC	·
Equipment D	есоп.	Meth	od: 3 Bu	cket Rinse wit	h Liquinox			Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	22.9	6 Time:	0646	GW Disposa	I: GW-11 Pond	1
	(2)	<u>ا چ</u>	Te	emp.		ЭН	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential		bidity	Duran	D4b A-	0
	NE I	2		(°C)		Units)		i/cm)		mg/L)		(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	AM T	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*		(ft BMP)	(ml)
0540			30,00		6.60		11.5		0.77		-31		98.1	1	Hand!	22.96	p.590
		-1-	we	11	101	dry	(a)	~ 0				rallon	/		001/		707
	+-+			717	01100	/	(4)	-0	70	/	9,5 9	xa//0/1	2 0	4175		23.75	
	 -		/5/	1000	150	harg	7-6	-	Sam	p.16_				 			
09.0	├─ ├	<u>.</u> -		lect	Can	1.	1001	(03.0			10						
0915		-	CO	IEGT	Sam	PIZ C	TML	1-025	- 201	7071					ļ	ļ	
									ļ							ļ	
	-	_															
		_ _				ļi											
				· 					16								
														<u>. </u>			
		-			 			 		80				 			
		-															
		-															
Commission ID:	1		4.4 =	<u> </u>				///					- / -				
Sample ID:	mple	C00	W-0)	<u> こう ト み の</u>	<u> 707/</u>	Ouplicate ID		114	1		QA/QC Sam	<u> </u>	V/4	•		COC Time:	0915
- 54	, ,		anei						Material Co	odes: VOA = 4	0 ml glass via					ene; O≃Other (Specify)
Number	Material								Comments	ntamination: /	Y) N	Field Filtered	Y	COC Numbe	rc		
Ferrous Iron= 0.17 mg//																	
									l lo	. **	- 17	,					¥
	ln-	Situ	Chromi	um Treatab	ility Study S	Sampling Bo	ottle Set		Groundwat	er Color is	CON	1-//	Corne	it's	a C.	uit o	dal
										1	or u y	10	12	(2)	7 The	11/ 0	001
									Signature	(s):	1		.0				20
INDICATOR									WITHIN:		-		<u> </u>	 -			
± 0.1 for	:Ha	±3	3% for	Specific (Conductiv	itv and Te	mperatu	re: ± 10	mv for Re	edox Pote	ntial: ±	10% for [)issolved	Oxygen	and Turbi	ditv	
BGS -	Below	Gro	und Surfa	ce	C - Centigrad	le .	GS - Grou	nd Surface	mg/L - millig	gram/Liter	min - Minu	te :	MP - Measuri	ng Point	100000	QA - Quality As	ssurance
RWb -	Relow	Mea	suring Po	tnic	COC - Chain	of Custody	ID - Identif	ication	mV - milli V	olts	ml - millilite	er (NTU - Nephe	lometric Units	3	QC - Quality Co	

LOW FLOW GROUNDWATER SAMPLING LOG

								<i>-</i> 11	0011011		0/1////	******	-		INE	in I, nellueis	on, nv mojec
Task Name:	In-Sit	u Chron	nium Tr	eatability Stud	у	Task Manag	er: Arul Ayya	aswami			Task No: N	A12			Well ID: CTN	/W-02D	
Field Sample	ers: Je	ff Riche	eson				<u> </u>				Recorded b	y: Jeff Riches	on		Date: 7	19/17	
Well Depth (ft BGS);::		MP Di	stance AGS (ft):		Well Depth ((ft BMP): 49.1	8	Screened/C	pen Interval T	op:		(ft BGS)		34 (ft BMP
Well Diamet	er (in):	2		PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	4	9 (it BMP
Pump and T	ubing `	Гуре: С	ED Sa	mpre Pro (blac	lder) with poly	tubing		Pump Intake	e Depth:		(ft BGS)	23,22	41	(ft BMP)	MP Description	on: TOC	
Equipment D	econ.	Method	: 3 Bud	cket Rinse with	Liquinox			Depth to Wa	iter Before Pur	np Installation	n (ft BMP):	22.24	Time: 7	1647	GW Disposal	GW-11 Pond	· · · · · ·
	G	<u>ي</u> ا	Te	emp.		H	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential		bidity	Purge	Depth to	Cum, Vol.
	8	=		*C)		Units)		/cm)	1 32 11 me 5 1	ng/L)	4 - 64 - 10 -	? (mV)		TU)	Rate	Water	Purged
Time	PURGING	SAMPLING	EAD	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1050	X		107		1.81		13.9		0.68		26	Ì	150		200	23,22	0
1053	n)		5.49		6,71		13.6		0.65		33		751		200	23,29	14
1100			161		6.64		13,3		0,65		49		57.5		200	23,30	26
1105		15	7/		6,63	· · · · · · · · · · · · · · · · · · ·	13,3)	0.65		33	 	30.0	<u> </u>	200	13,30	3 (
1110	X		5.92		6,62		13.3		0,64		34	<u> </u>			 		
1115			5.76		6,64		33		+		36		28	{ -	200	23.29	41
	7		164				13.3		0,66						200		_5
1135	14	_ 17	07	1	6,66	Class	13.4		0,68		39		26,7	1	200	23,31	64
		·	01	dmet	2/5	Stal		ea		-/-	10			ļ	•		•
1120		^	(0)	lect	Sam	216	TMU	V-00	10-20	71 70 1	177						
						A NOVA							<u> </u>	<u> </u>			
	<u> </u>	-							615						<u> </u>		ia.
					_												
Sample ID:	CT	MU	P=0	20-30	17071	Suplicate ID		NA			QA/QC Sam	nples/ID:	NA		<u> </u>	COC Time:	
Sa	mple	Contai	ner									<u>. </u>		=Clear Glass:	PE=polyethyle		Specify)
Material Field Decontamination: (Y) N Field Filtered: Y O COC Number:																	
Number	Co	de	Volun	ne I Pre	servative	Intended /	Analysis and/	or Method	Comments:			/ .					
		_					· · · · · ·		Ferrous Iron	= 010	DAM9	7/, (
<u> </u>	<u> </u>	Cit. C	laaa .		Ch. Ob. d. C				Sulfide =	0.0	3 mg						
	111-	Situ C	nromii	um Treatabi	iity Study S	sampling Bo	ottle Set		Groundwate	er Color is	12110	w					
																ĺ	
*INDICATO	R PAF	RAMET	FRS H	IAVE STABL	IZED WHEN	I 3 CONSEC	LITIVE RE	DINGS ADD	Signature(:	s)	fol	112	=				
				Specific C						dox Pote	ntial· -	- 10% for f)iesolvo:	1 Ovuesa	and Turbic	dit.	8
BGS -	Belov	/ Groun	d Surfa	ce	C - Centigrad	е		nd Surface	mg/L - millig		min - Minu		MP - Measur			QA - Quality As	surance
BMP -	Belov	v Measi	iring Po		COC - Chain		ID - Identif		mV - milli Vo		ml - millilit			lometric Units		QC - Quality Co	

								00/10/1	MILIT	OMINI L		, u	,	· N	EHI, Henders	son, NV Projec
Task Name	In-Situ (Chromium T	reatability Stud	ly	Task Manag	er: Arul Ayya	swami			Task No: M	12	_		Well ID: CT	MW-03S ,	
Field Sample	ers: Jeff	Richeson					_			Recorded by	y: Jeff Riches	on		Date:	7/18/17	7
Well Depth	(ft BGS):		MP D	istance AGS (ft):		Well Depth	(ft BMP): 24.3	5	Screened/O	pen Interval T	ор:		(ft BGS)		19 (ft BMP
Well Diame	er (in): 2		PID/F	ID Readings (Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	1	24 (ft BMP
Pump and T	ubing Ty	pe: Mega N	fonsoon pump	with poly tubi	ng		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Description	ion: TOC	
Equipment I	Decon. M	ethod: 3 Bu	icket Rinse with	n Liquinox			Depth to Wa	iter Before Pu	mp Installation	n (ft BMP):	22,5	7 Time: 6	702		l: GW-11 Pond	1
	ا ال	Т	emp.	r	Н	Spec Co	nductivity	Dissolve	d Oxygen		Potential		oidity	1 10 00 00		i
1	NS S	1	(°C)		Units)		/cm)	1 MAN 10 11 11 11 11	ng/L)	- 15 - 1 - 1	(mV)	at .	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1110	X	30 6	3	6.61		10,9		0.79		101		29,4		100	22.59	0
1115	X	29.3	9	6.74	·	10.9		0.65	-	1/3				100	22,62	
1 .	X		/	173		10.9				150		150		1		500
1139	1	28,6	f	8,51		-		0.79		134		1815		100	22.6/	14
1125	1	28.50				19.7		0.90		125		17.8		100	22,62	1,51
1139	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	28,35	/	6,69		11,0		0,00		123	·	17.5		100	22,6/	24
1135	11			6,67		11,0		0.88		125		17,1		100	22, 63	
1140	X	28.2		6.65	1 1	11,0		0.87		124		16.3		100	22.63	32
	<u> </u>	Para	mete	15 5	tabil	1200	<u> </u>									
1149		6011	ect s	amp/	c 67	mw.	035	-201	7071	8						
	<u> </u>			/											1	
								-								
						··-							<u> </u>	(5)		
							7777				,					
	 							<u></u>							:	
																
Sample ID:	1 4 4 4		2 (2 - 2 - 2	710	Dunlingto ID		/ 1									
Sample ID.	ample Co	ontainer	35-2017	0118	Duplicate ID	\sim	IA	Maria de Co	d1/0.4	QA/QC Sam	·	MA			COC Time:	1/40
0.	Materia								des: VOA = 4 stamination: (Field Filtered		Clear Glass; COC Numbe		ene; O=Other (Specify)
Number	Code	- 1	me Pre	servative	Intended A	\nalysis and/	or Method	Comments:		-/- 	rieid Fillered	: Y (N)	COC Numbe	<u>r;</u>		
									= 0,00	mg/	,/					
·					······································	·-····································		Sulfide =	0,00	m9/						
	In-Si	tu Chrom	ium Treatab	ility Study S	ampling Bo	ttle Set		Groundwate		Lellon						,
										g Circ	_					
								Signature(s):	2/		1				
			HAVE STABL							7						
			Specific C									<u>)issolved</u>	Oxvaen	and Turbi	dity 1	
		Bround Surfa Measuring P		C - Centigrad		GS - Groun		mg/L - millig		min - Minut		MP - Measuri			QA - Quality As	
DIVIE	- Delow IV	neasuning P	OILI	COC - Chain	oi Custoay	ID - Identifi	cation	mV - milli Vo	oits	ml - millilite	er l	NTU - Nephel	ometric Units	i .	QC - Quality Co	ontrol

LOW FLOW GROUNDWATER SAMPLING LOG

							7 17 7 20		0011011	77-11-411	OAM L	LIIYO LC	<i>,</i>		IN:	EHI, Hender	son, NV Projeci
Task Name:	In-Situ	Chromium 7	Treatability	Study		Task Manag	er: Arul Ayya	aswami			Task No: N	/12			Well ID: CT	MW-03D	
Field Sample	ers: Jeff	Richeson									Recorded b	y: Jeff Riches	son		Date: 7/	19/17	1
Well Depth (MP Dist	ance AGS (it):		Well Depth ((t BMP): 39.4	9	Screened/C	pen interval T	op:		(ft BGS)		34 (ft BMP)
Well Diamete						Beneath Inner	Cap (ppm cg	ge akb):			Screened/C	Open Interval E	Bottom:	··	(ft BGS)		39 (ft BMP)
Pump and T					<u></u> -	tubing		Pump Intake	Depth:		(ft BGS)	_	37	(ft BMP)	MP Description	on: TOC	
Equipment D	econ. N	lethod: 3 Bi	ucket Rins	e with L	_iquinox			Depth to Wa	ter Before Pur	mp Installation	r (ft BMP):	275	Time: £	065a	GW Disposa	l: GW-11 Papa	d
	09	1	Гетр.		p	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Tur	oidity	Purge	Depth to	Cum. Vol.
			(°C)			Jnits)	*	/cm)	4.19.00	ng/L)	ORF	2 (mV)		TU)	Rate	Water	Purged
Time	PURGING	READ	CHAN	GE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0555	X	26.9	3		7.47		10.6		0,55		23	† 	28,/		200	22,75	0
9600		26,17			7,30		10.7		0,60		63	1	6.7		200	22.79	
0605		25,8			7.30		10.8	 	0,72		80		3.5		200	23.81	
0610		25,70	<u> </u>		7.39		10.8		0.85	6	91						3/
0615	7	25.8.										-	2,9		200	37,83	76
					7,27		10.8		0.73	6).	98	<u> </u>	2.9		900	37.83	72
0630		25.7			7.39_	·	10.9		0.75		103	-	3.1		900	57'83	54
0625		25,65	?		7,26,		10.9		0.76		108		3.0		200	23,82	6.4
0630	<u> </u>	25,74			7,24	1-1-1	10.9		078		110		3,0		200	23.83	7
		Par	ame.	ter	5 5	tab111	200							<u> </u>			
0630		Coll	cct	500	nple	CIM	W-0	30-20	1707	19					#/		
					/												
			-														
Sample ID:	CTM	16-031	0- 201	70	210	Duplicate ID:	N	14	7/4		QA/QC Sam	nlec/ID:	NA			COC Time:	0/30
Sa	mple C	ontainer	7 207	10	7 7		,,,,	<i>,</i> ,	Material Cor				_ · · ·	-Clear Glace:		ene; O=Other (
	Materi	al							Field Decon	tamination:		Field Filtered		COC Number		ene, O=Other (Specily)
Number	Code	Volu	ıme	Prese	ervative	Intended A	nalysis and/	or Method	Comments:		100	/			<u> </u>		
									Ferrous Iron	= 0,00	NY	,					i
	Sulfide = 0,00 mg//																
	In-Situ Chromium Treatability Study Sampling Bottle Set Groundwater Color is \(\frac{\ellow}{\ellow} \)																
PINIDICATO	NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:																
											/	40015					,
RGS.	Below (around Surf	ace Specii				mperatui	re: ±10							and Turbic		
	BGS - Below Ground Surface C - Centigrade GS - Ground Surface BMP - Below Measuring Point COC - Chain of Custody ID - Identification								mg/L - millig: mV - milli Vo		min - Minu ml - millilite		MP - Measuri NTI I - Nanha	ng Point Iometric Unite		QA - Quality A	

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

						DWILL	JW GIN	COND	MILA	SAIVIF	LIIVG LC	JG		N	ERT, Henders	son, NV Project
Task Name:	In-Situ (Chromium Ti	reatability Stud	у	Task Manag	er: Arul Ayya	aswami			Task No: N	112			Well ID: CT	MW-04S	
Field Sample	ers: Jeff	Richeson								Recorded b	y: Jeff Riches	on		Date: 7	118/17	7
Well Depth (ft BGS):		MP Di	istance AGS (ft):		Welt Depth (ft BMP): 24.0)1	Screened/C	pen Interval T	op:		(ft BGS)		19 (ft BMP)
Well Diamet	er (in): 2	!	PID/F	ID Readings E	Beneath Inner	Cap (ppm cg	je akb):			Screened/C	pen Interval B	lottom:		(ft BGS)	777	24 (ft BMP)
Pump and T	ubing Ty	pe: Mega M	lonsoon Pump	with poly tubi	ng		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Descripti	on: TOC	
Equipment C	econ. M	ethod: 3 Bu	cket Rinse with	1 Liquinox			Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	22.80	Time: <	2706	GW Disposa	l: GW-11 Pond	<u> </u>
	ارم ا <u>م</u>	To	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Bedox	Potential	Turi	bidity	Duran	Donth to	Cum, Vol.
	E E		(,C)		Jnits)		/cm)		mg/L)		(mV)		TU)	Purge Rate	Depth to Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*		(ft BMP)	(ml)
0940	X	27.85		6.62		11.3		1,90		54		38.1		100	22.80	0
45.	X	29,26	9	6.75		11.3	<u> </u>	1,62		18		60,2		100	22.88	500
0950	X	29,07		6,77		11.3		1.55		15		65.9	1	100	22,97	
0955	Y	29,14		6.79		11.3		1 47		5	 	59.9		100	23,02	1.56
1000	X	29,25	-	6,72		11,3		177		3	 	57,4	1	100		
1005	X			6,72		7		1,42	1	-2		58.8			23,03	2.52
	X	29,37		6,73		11 12			ļ		<u> </u>	60.2		100		
1010	1 -	29,54				11-2-	///	1,40			<u></u>	8017		100	23,02	34
10/0	v	,	c.//	para	met	e/ 5	Stat	77				<u> </u>	10			
1019		\	Colle	CT_	Sam	010	CIMO	1-04	5-20	110	118			ļ	-	
<u> </u>	 												ļ	<u> </u>		
				ļ <u></u>			<u> </u>									
E0111 - 221									411					ļ		3.5
	<u> </u>													<u> </u>		
	 													<u> </u>		
						<u> </u>						2				
Sample ID:	<u>CT/</u>	MW-1	245-20	170718	Duplicate ID	: /	VIA			QA/QC San		NA	7		COC Time:	1010
Sa		ontainer					·								ene; O=Other (Specify)
Number	Materia	- 1	me Pro	servative	Intended	Analysis and/	or Mothod	Comments	ntamination:	Y) N	Field Filtered	: Y (N)/	COC Number	er:		•
Transcr	1 0000	1 70.0.	1	,0011411140	antersaea :	rinalysis and	OI MELIOU		n= 0.10	n91	/ //					
3.								Sulfide =	0 0	7 ~19	///					
	In-Si	itu Chromi	ium Treatab	ility Study S	Sampling B	ottle Set		Groundwat	(), 0 er Color is	:18 a/	- /	_	^			
									`	111	1	R 1	R	\sim		
								Signature	(s):	y v						
			HAVE STABL							τ						
± 0.1 for			Specific C													
BGS.	- Relow (Ground Surfa	ace	C - Centigrad	е	GS - Grou	nd Surface	mg/L - millig	gram/Liter	min - Minu	ıte	MP - Measus	ing Point		QA - Quality As	ssurance

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units



Task Name:	In-Situ C	hromium Tr	reatability Stud	ly	Task Manag	er: Arul Ayya	swami			Task No: M	112			Well ID: CT	MW-04D	
Field Sample		·	<u>-</u>	<u> </u>					<u> </u>	Recorded b	y: Jeff Riches	on		Date: 7	118/17	
Well Depth (MP Di	stance AGS (ft):		Well Depth (ft BMP): 48.9	9	Screened/O	pen Interval T	op:	10	(ft BGS)		34 (ft BMP)
Well Diamete			PIÐ/F	ID Readings 6	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval E	lottom:		(ft BGS)		49 (ft BMP)
		e: QED Sa	imple Pro (blac	ider) with poly	tubing		Pump Intake	Depth:		(ft BGS)		41	(ft BMP)	MP Descripti	on: TOC	
Equipment D	econ. Me	thod: 3 Bu	cket Rinse with	n Liquinox			Depth to Wa	ter Before Pu	mp Installation	n (ft BMP):	23.01	Time:	0708	GW Disposa	I: GW-11 Pond	4
	PURGING SAMPLING		emp. (°C)		oH Units)		nductivity /cm)		d Oxygen mg/L)	The same of the sa	Potential (mV)		bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAM SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(mi)
0805	X	27,06		7.59		12,6		0.79		47		780		200	23,01	0
0810	X	26.2		7.26		12.6		0,48		-) 9		282		200	23./2	14
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	26.08		7, 23		12.6		0.52		-31		98,1	ń	200	23,14	2L
0872	夕一	25.94		7,22		12,7	ļ	0.48		-27		13:4		200	23./7	31
0825	X	26.04		7.20				0.52		-35		76.8		200	7	4L
0830		25.9		7,20		12.8		0.60		-32		34.0		200	23119	51.
0835		25.87		7.19		12.9		0.64		-31		24,0	1	200	23.19	6 L
0840	X-	25.98	}	7,25	-	13.9		0,66		-34		22.1		200	23,18	フレ
OGUC	X	13110		7,28	<u></u>		 	0.69		-37		20.7		200	13.19	8 L
0845	X	36.05		11 20		12.8				-36		18.8	1	200	23.20	9L
0850	<u> </u>	96.11	L	7,28	tabil			2,71	l	- 70	<u></u>	0.0		200		/
	 	Pari	METE	رر	1.	200	1-011		07/6	>		1		<u> </u>	 	
		011	CUT	Samp	7 6	77010	-041	-201	70110	}		 	ļ		 	
		 			<u></u>						 	 	ļ	 		-
		 		<u> </u>			<u> </u>		 			ļ	<u> </u>		1	<u> </u>
Commis ID:	C T 00	1./= . ()	30/70=	107	Duplicate IC	<u> </u>	NA	<u> </u>	!	QA/QC San	nnice/ID:	NA			COC Time:	
		ontainer	-201707	718	Dupitcate it	vi	10(:-		ndes: VOA = /				=Clear Glass	: PF=nolvethy	lene; O=Other	
	Materi								ntamination:		Field Filtere		COC Number		10110, 0 - 011101	(,)
Number	Code		ıme Pr	eservative	Intended	Analysis and	/or Method	Comments	.,	.11		1				
								Ferrous Iro	ou= 0'05	\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\						
								Sulfide =	10.0	$M_{\rm eff}$,					
	In-S	itu Chrom	ium Treatat	oility Study	Sampling E	lottle Set		Groundwa	ter Color is	Yello	W	•				
		_						Signature	(c): /	m	R	b			*	
*INDICATO	D DAR	METERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE BE	ADINGS AR		(3)							15
			r Specific						edox Pote	ential:	± 10% for	Dissolve	d Oxvaen	and Turb	idity	
` .		Ground Surf	564	C - Centigra	de		and Surface	mg/L - mill		min - Min	ute	MP - Measu	ring Point		QA - Quality	
BMP	- Below I	Measuring F	Point	COC - Chair	n of Custody	ID - Identi	fication	mV - milli \	√olts	ml - millili	ter	NTU - Neph	elometric Unit	s	QC - Quality	Control

LOW FLOW COOLINDWATER CAMPLING LOG

						OW IL	OW GA	CUNDV	VAIEN	JAIVIF	LIIVG L	JG		N	IERT, Henders	son; NV Projec
Task Name:	In-Sit	u Chromium T	reatability Stud	dy	Task Manag	ger: Arul Ayy	aswami			Task No: N	A12		0_	Well ID: CT	MW-05S ,	
Field Sample	ers: Je	eff Richeson								Recorded b	y: Jeff Riches	ion		Date:	7/17/	7
Well Depth (ft BGS	S):	MP D	istance AGS	(ft):		Well Depth	(ft BMP): 24.5	5	Screened/C	Dpen Interval T	op:		(ft BGS)		19 (ft BMP
Well Diamet	er (in):	2	PID/F	ID Readings	Beneath Inner	Cap (ppm cg	ge akb):	-0.05	- 20	Screened/C	pen Interval E	ottom:		(ft BGS)		24 (ft BMP
Pump and T	ubing	Type: Mega M	lonsoon Pump	with poly tub	ing		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Descripti	ion: TOC	
Equipment (Decon.	Method: 3 Bu	cket Rinse wit	h Liquinox			Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	23.28	Time:	07/0	GW Disposa	al: GW-11 Pond	t
	[m]	g T	emp.	T	рН	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential		oidity	Purge	Depth to	Cum. Vol.
	NE NE	튑	(°C)		Units)		i/cm)	\$ 1.500 M W	mg/L)		? (mV)		TU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	2 2 4 5 T/S	CHANGE*	READ	CHANGE*	READ	CHANGE*		(ft BMP)	(ml)
1305	X	32.26		6.61		11,5		2.4	2	113	Ť T	378		100	23,28	0
1310	X	31,43		6,57		11.7		0.75		110		12.1		100	23.35	
1315	X	31.68				11.8		0.81		118	-	11.2		100	23,37	-
1320	X	31,34		6.49		11.9		0,90	×	118		9.6		100	23,38	
1325	X	31,40		1.45		119	1	0.75	-	118		9.5		100	23.39	26
1330	X	31.57		6.51		116		0.78	1	114	†	9.7		100	23.40	a.5C
1335	X	31.55		6.54		11.8		0.80		13	1	10.2		122	23,40	34
	x	31.61		6.5		11.9		0.82		115		11,0			10 10 10 10 10 10 L	3.57
1349	7				-		1.20	1	-	110	-	1110		100	23.37	3,30
12110	1	Pa	ram	700) /5	1001	1120		-		-					
1349	+ +	Col	rect	San	2016	CTI	nu-	055	201	107	1			-		
	++	-					-				-			-	-	
	1									-	-			-		
	-	-				-					-			-	, ,	
	+	_													1	
							,,,,						-2010112			
Sample ID:	07	M4/-C Container	255-2	017071	- Suplicate ID	\sim	14	16	1 1104		nples/ID:	-			COC Time:	1340
- 30	_	erial							odes: VUA = 4 ntamination: <i>L</i>		ial; AG =Ambe Field Filtered				lene; O=Other (Specity)
Number	10	de Volu	me Pr	eservative	Intended .	Analysis and/	or Method	Comments		IV IV	Trieid Fillered	. 17,11/	COC NUMBE	л.		
	T	1							n= <i>0, 04</i>	1 mg/	1					
							000000		0,03							
	ln-	Situ Chromi	ium Treatab	ility Study	Sampling B	ottle Set	76	Groundwat		1261	~					
									0	~	1 R					
*******	D D 4 1							Signature	(s):	//						
		RAMETERS I							adau Don		400/4					1.6045
BGS	- Belou	v Ground Surfa	ace	C - Centigrad			nd Surface	my tor He mg/L - millig		min - Minu		MP - Measur		and Turbi	QA - Quality As	couronac
	-			- contigion			III CUITACE	myre man	granivellol	TIME TOWARD	ato:	INIL - INICAPIL	niu Eviill		- UM - QUAINV A'	.oouldlice

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

					\$5 (0.8Fs.										Etti Titondoro	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Task Name:	In-Situ	Chromium T	reatability Stud	У	Task Manag	er: Arul Ayya	ıswami			Task No: M	12			Well ID: CT		
Field Sample	rs: Jef	Richeson						_		Recorded by	y: Jeff Riches	on		Date:	7/18/1-	
Well Depth (t BGS):		MP D	stance AGS (ft):		Well Depth ((ft BMP): 54.0	0	Screened/O	pen Interval T	op:		(ft BGS)		34 (ft BMP
Well Diamete	er (in):	2	PID/F	ID Readings B	Beneath inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		54 (ft BMP)
Pump and Tu	ubing Ty	ype: QED Sa	ample Pro (blad	lder) with poly	tubing		Pump Intake	Depth:		(ft BGS)	33.US	44	(ft BMP)	MP Descripti	ion: TOC	
Equipment D	econ. N	Method: 3 Bu	icket Rinse witl	n Liquinox			Depth to Wa	iter Before Pui	mp Installatio	n (ft BMP):	3-	Time:	7/2	GW Disposal	il: GW-11 Pond	J
	<u></u>	Т	emp.	p	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turi	oidity	Purge	Depth to	Cum, Vol.
			(°C)		Jnits)		/cm)		mg/L)	ORP	(mV)	(N	TU)	Rate	Water.	Purged
Time	PURGING SAMPI ING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0555		28.49		8.00		11,1		0.60		/37		375		100	23.48	0
0600	X	27,40		713		11 2		0.69		136		71.1		200	23,54	14
	X	26.52		7 31		11 2		0.67		136	 	12,4		200	a3.58	aL
0605		36.54		7,26		11:3	1	0.79			<u> </u>	5,7	1	200	23.59	36
010				7140		11.3	 		+	137	+	31 (200	23,60	111
0615		36.37		1.24		11,2		0.75	1	139	 	4.4	 			4L 5L
0670		26.90		7.21		11.3		0.7/			 			500	23.58	2 //
0625	X	26.3€	/-	7,24	, , , , , , , ,	11.4,		0.80	 	140	ļ	3.4		200	23,59	7 64
		pal	omjete	15 5	lab, 11	200	ļ	ļ		ļ						
0625		Cell	ect s	ample	CTN	W-05	D-201	707/	8 (25/N	150)		ļ			
				/												
	1															
	1															
						 		1	<u> </u>	1				1	-	
																,
Cample ID:	0.40	1/)-20170	710	Duplicate ID).	1			OMOC San	nples/ID: /	nclass	CEM	W-05D-	+COC Time:	
		Container)-401 /U	117	Duplicate it	· ·		Material Co	ndes: VOA =						rlene; O=Other ((Specify)
	Mate										Field Filtered		COC Numb			
Number	Coc		ume Pr	eservative	Intended	Analysis and	or Method	Comments			1.		1			
			1	**		· -		Ferrous Iro	n= 0.6	לקח סכ	/					
								Sulfide =	0.00	1/2/)					
	ln-	Situ Chron	nium Treatal	oility Study	Sampling B	lottle Set		Groundwat	ter Color is	Jellor	\sim .					
										1 1	0 10					
								Signature	e(s):	n/			1	<u>.</u>		
			HAVE STAB						2 1 <u>2</u> 110	/	000000					
														and Turb		
RGS	- Relow	Ground Sur	face	C - Centigra	de	GS - Grou	ınd Surface	ma/L - milli	igram/Liter	min - Min	ute	MP - Measu	nna Point		QA - Quality A	Assurance

LOW ELOW COOLINDWATED CAMPLING LOG

					LC	JVV FL	אע שער	וישויטט	MIEN	JAIVIPL	ING LU	/ G		N	ERI, Henders	on, NV Project
Task Name	: In-Situ (Chromium To	reatability Stud	у	Task Manage	er: Arul Ayya	aswami			Task No: M	112			Well ID: CTI	MW-06S	
Field Samp	lers: Jeff	Richeson					_			Recorded by	y: Jeff Riches	on		Date:	7/17/1	7
Well Depth	(ft BGS):		MP Di	stance AGS (ft):		Well Depth (ft BMP): 24.4		Screened/O	pen Interval T	ор:		(ft BGS)	1	19 (ft BMP)
Well Diame	·		PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)	2	24 (ft BMP)
		· · · · · · · · · · · · · · · · · · ·	lonsoon Pump	with poly tubi	ng		Pump Intake	Depth:		(ft BGS)		24	(ft BMP)	MP Descripti	on: TOC	\$\\\
			cket Rinse with				Depth to Wa	ter Before Pu	mp Installation	n (ft BMP):	23.5	Time: ¿	27/4	GW Disposa	l: GW-11 Pond	
	9 9	TEST	emp.	I STATE OF	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turk	oidity /	Purge	Depth to	Cum. Vol.
	PURGING		(°C)	(pH l	Jnits)	(uS	/cm)	DO (mg/L)	ORP	2 (mV)		TU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0930	X	33.7	7	6.92		-111.	1	0.80		-154		143		100	23.53	0
003	-1	33.81		6,74		11.3		0,71		-141		149		100	22,57	500
		34,02		6.65		11.4		0.68		-112		154		100	22,60	14
0949	43-1-	7	1			11 2		0.65		-115	1	157		100	22,65	1.57
0745	1	34.10		1		110				-1/7		1 - 4		100		
0950	-/	34,20		6.58		11.6		0.63	<u> </u>			152			22,68	_24
0955	X_	34.26		6160		1/1/	-/	0,61		-120	<u> </u>	155		109	32,70	_2.5.
	_	2	arome	ters	Stab	1/17-6	1 (0)	099	5.5		ļ				ļI	
								, -		<u> </u>						
_																
	- -	-								ē.						-
		 					 	<u> </u>			1					
			<u> </u>					<u> </u>		ļ <u>.</u>	 	<u> </u>		-		
	_	ļ	ļ						ļ	ļ		 				
				<u> </u>			1 /1 /1				- ""			<u> </u>	2227	and a section
Sample ID:	CTM	1W-06	5-20170	7/7	Duplicate ID): /	VIA	1 100 100 2		QA/QC San	*	NI	4	DE 1 11	COC Time:	0955
5	Sample C								odes: VOA = ontamination:		Field Filtered		=Clear Glass		lene; O=Other (Specify)
Mumbar	Mater	444	ıma Pr	eservative	Intended	Analysis and	Vor Mothod	Comments		T) N	Freid Filterei	JET (N)	TCOC MILLID	31:	91	22
Number	Code	y VOIL	TILIG LI	eservative	I IIIIeiiueu	Allalysis allu	701 Metriod		-	- mal	/					Ti _a
								Sulfide =	0,09	5 mg/	"/					
	In-S	L itu Chrom	ium Treatab	ility Study	Sampling R	ottle Set		4 1		park (Grav	W/ FA	mond	ina I	ruit ou	dor
	1		ilanii i i catae	mity Otally		01110 001				,		1 1	37.16.41	11/ 11	41/ 00	1
								Signature	(s):	n	0	1/2		271	10	f :
*INDICAT	OR PAR	AMETERS	HAVE STABI	LIZED WHE	N 3 CONSEC	CUTIVE RE	ADINGS AR		. ,		7			7		
			r Specific (edox Pote	ential: :	± 10% for	Dissolve	d Oxvaer	and Turb	idity	
		Ground Sur		C - Centiora			and Surface					MP - Measu			QA - Quality A	ssurance

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

n C					L	OW FLO)W GR(DUNDN	/AIEH	SAMPL	.ING LU	lG		NE	ERT, Henders	son, NV Project
Task Name:	In-Situ C	Chromium Tre	atability Study	v	Task Manag	er: Arul Ayya	ıswami		<u> </u>	Task No: M	12			Well ID: CT!	WW-06D	
Field Sample							·			Recorded by	y: Jeff Riches	on		Date: 7	117/17	
Well Depth (f			MP Dis	stance AGS (f	(t):		Well Depth (ft BMP): 54.2	5	Screened/O	pen Interval T	ор:		(ft BGS)		34 (ft BMP)
Well Diamete			PID/Fi	D Readings B	eneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		54 (ft BMP)
Pump and Tu	ibing Ty	pe: QED Sar	nple Pro (blad	der) with poly	tubing		Pump Intake	Depth:		(ft BGS)		44	(ft BMP)	MP Description		
Equipment D	econ. M	ethod: 3 Buc	ket Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installation	n (ft BMP): '	23,84	Time: _	2716	GW Disposal	: GW-11 Pond	<u> </u>
	رم ال <u>ن</u>	Te	mp.	р	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turk	oidity	Purge	Depth to	Cum. Vol.
	를 를	1176	·C)	(pH l	Jnits)	(uS	/cm)		mg/L)	ORF	(mV)	(N	TU)		Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1050	X	31,56		7.71		12,4		0,51		-98	1	240		200	23.84	0_
1055	X	30.00		7,17		12.5		0.40		-2 3		126		200	23,91	14
1100	X	29,87		7.05		12.7		0.33		a5		53.		200	13.94	2/
1105		30.11		6.92		12.7		0.43		6		18,5		200	23.96	3/
	X	30.16		6,96				0.46				19.1		200	23,99	4/_
110_	\(\)	30.19		4(12.8		0.50		72		13.3		200	24,01	SL
1172-	 	39.34		6.96		12.9		0.53		78	<u> </u>	11.5		200	24.03	-6L
1190	1	39.38		6,96		12.9		0,65		81		9,3		200	24,02	74
1172	 	30.46		6,96		D. 9	ļ	_		85		7,7		200	24,03	
1132		30,50		1 01		-	<u> </u>	0,63	 					200	24.04	94_
1150	N-			6,96,		12.9		0,65		87	-	6.9			24.05	10/_
1140	/	30.5	-00/	6.96	,	121	7	0,63		7				900_	4-1,0)	
	 	par		15	stabi	7	/								- 70	
1140		1 Coll	ect	sam	ple c	TML	V-06D	-9017	0717	_t_(7MW	-060	201	707/	1 11	<u> </u>
	 	-		<u>′</u>		12		ļ			-		 			
						A	<u> </u>	/ 2 >	1		1 75	<u> </u>			COC Time:	- 244 A.D.
Sample ID:	<u> 71,</u>	MW-0	60-201	70717	Duplicate II	D: 67/	nw-0	61)- 201	70717-5	40 ml place	nples/IU:	or Classi CC	-Class Class	DE-polyothyl	lene; O=Other	(Specify)
Sa	Mater	ontainer							ontamination:		Field Filtered		COC Numbi		ene, O=Oliler	(Specify)
Number	Code	ULL COMMENT	me Pro	eservative	Intended	Analysis and	/or Method	Comments		4/1	Troid Filter		1000110		·	
710111001	000							Ferrous Iro	$o_{n=} 0.00$	29/1						
								Sulfide =	A	∧/ ⊦7 / /	,	1				
	In-S	itu Chromi	ium Treatab	ility Study	Sampling E	ottle Set		Groundwa	ter Color is	yello	W				1	
								.	1	11	RR	_ /				
						A. (21)		Signature	e(s):	// 1			V	30.4	-	
			HAVE STABI						aday Det	/	. 100/ 4	Diocelus	d 0v	and Turk	idite .	
± 0.1 for	pH:	± 3% tor	Specific (conductiv	/itv and I	emperatt	ire: ± 10	INV TOP H	edox Pot	enual:	I 10% 10	PISSOIAG	n OYAGEU	allu lulb	TOTTY	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control



WELL WATER LEVEL MEASUREMENT LOG

Page $\underline{\hspace{0.1cm}}$ of $\underline{\hspace{0.1cm}}$

Task Name: In-Situ Crtreats 124 Stuly	Task No: M12	Date: 8/22/17
		Recorded by: Krady
Equipment Model/Type:	Serial Number:	Last Calibration Daje:
Heron HOIL	032744 (Pine)	

Heron HOIL			032+44	(Pine)	
Well Identification	Measuring Point (MP)	Time (hrs)	Depth to Static Water Level (ft BMP)	Well Sounding Depth (ft BMP)	Condition of Well and Well Seal
CTIW-015	TOL	0749	22.19		(700D)
CTIW- OID		0750	22.99		G00D
CTIW-025		0752	21.40		GOOD
CTIW-02D		0753	22.76		GOOD
CTIW - 035		0755	71.7-5		Good
CTIW - O3D		1530	24.23		DIFFILMS TO VARREW CAP,
CTIW-OIS		0746	22.50		G00)
CTMW-OID		0747	22,72		GOOD
CTMW - 025		0742	DRY	23.70	6000
CTMW - 02D		0743	23.36		6000
CTMW-035		0741	22.64		Good
(TMW-03D		0742	22.80		G00D
CTMW-045		0740	22.89		Good
(TMW-040		0741	23.07		Good
(TMW -055		0739	23.36	<u> </u>	Goog
(TMW-05D		0740	23.53		Goop
CTMW-065		0735	23.59		6000
CTMW - 06D	7	0736	23.96		Good
<u> </u>					
		-			
4					
				17	
				8-22	
			454	0	
9 Ma .					
					3

I OW FLOW GROUNDWATER SAMPLING LOG

							JWIL	JW Gn	CONDI	MILN	SAIVIFL	IIVG LU	<i>/</i> G		N	ERT, Hender	son, NV Projec
				reatability Stud		Task Manag	er: Arul Ayya	aswami			Task No: M	112			Well ID: CT	MW-01S	
Field Samp	lers: .	Jeti P	licheson	D. Lead	y, KI	ew					Recorded by	y: J eff Riches	OLDICE.	edy Killy	Date: 8	74-17	
Well Depth	(ft BG	S): _		MP Di	stance AGS (ft):			(ft BMP): 23.7	8	T-	pen Interval T		11-1	(ft BGS)		19 (ft BMP
Well Diame	ter (in): 2		PID/FI	ID Readings (Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	Sottom:		(ft BGS)	2.5	24 (ft BMP
Pump and T	Tubing	Тур	e: Moga M	onsoon Pump	with Poly Tub	ing / bail	er	Pump Intake	Depth:		(ft BGS)		23.5	(ft BMP)	MP Description	on: TOC	
Equipment	Decor	ı. Me	thod: 3 Bud	cket Rinse with	n Liquinox			Depth to Wa	iter Before Pu	mp Installation	n (ft BMP):	22,50	Time:	A46/8-22.A	GW Disposal	: GW-11 Pond	1
	C	Q	DE LE	emp.	REFERRED.	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redov	Potential	and the second second second	bidity		BETYER SALESAND	194 Care
	18	悥		*C)		Jnits)	MIS		M-7 DO ((mV)	NAMES OF THE PARTY	ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	E.	SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1057	1.		30,80		6.47		14.6		0.00/186		-114	, and a section	624		200	Nm	
1102	25	\Box	Stopp	1 200	1	us to D		.1962		1 .	1	. (1	1	1 0		 	1
1115	X	\Box	Punged	and purg		sing- we	1 191 4	y, una	Le To a	10N-104	DW THE	tan to	u atte	40 1007+10	W1)	purge 31	101 JMES.
1145	-	X	>90%	recion	al (3 g		inwe?)	/ []						1		3.5	
	1	8 4		1 eavery	; began	Jample		barter	20	<u> </u>	71		000	<u> </u>		ļ	
1150		\cap	30.6		(6.51_		94.2		2,00		-71		245				
	-													ļ			
	-																×
																	=
																72	
													110			-	
													05/2				
		1										 	1	1251			
														1 -1-	,		
	+												<u> </u>	, ,	/		- T. /
	-												17.5				
Sample ID:	- ८न	MV	V-015-	201708	24	Duplicate ID	. 70				04/00.0	1 45	122		=		17.1.4
			ntainer	201100	<u>CŢ</u>	Dublicate ID		Lateral German	Material Co		QA/QC Sam	*	0100	OI OI		COC Time:	1145
		terial		North City						ntamination:		Field Filtered		=Clear Glass; COC Numbe		ene; O=Other (Specify)
Number	Cold from	ode	Volur	ne Pre	servative	Intended A	Analysis and/	or Method	Comments:		1 11	I leiu i illeteu	14 111	LCOC IAGIIIDE			
							<u></u>		Ferrous Iron	n= 3,70 /	nall						
	In	ı-Sit	u Chromi	um Treatabi	ility Study S	ampling Bo	ottle Set		Sulfide= (n= 3,30 ,).62 mg	W.						
									Groundwate	er Color is	lockish	vella.					
			<u> </u>							< 1	1001	76174					
			<u> </u>						Signature(s):	ر) ه (1				- 4	
				AVE STABL													
± U.1 for	DH:	<u></u>	: <u>3% for</u> round Surfa	Specific C										d Oxygen			
			round Surra easuring Po		C - Centigrad COC - Chain		GS - Groun ID - Identifi		mg/L - millig mV - milli V		min - Minu ml - millilite		MP - Measu	ring Point elometric Units		QA - Quality A	ssurance
				-			10011111	Janon	1154 1111101 A/	UIIG	110 - 1100000	DI.	MAPH - NAPH	alomenic Oulis		QC - Quality C	OINTOI



	3 00							JUILDI	VAILN			/				son, NV Projec
			reatability Stud			jer: Arul Ayy	aswami			Task No: N		• / /		Well ID: CT	,	
Field Sampl		Richeson		D. Kead			1		 .				D. Kady	Date: 08/		,
Well Depth				stance AGS			Well Depth (41		Open Interval 1	<u> </u>		(ft BGS)		34 (ft BMF
Well Diamet					Beneath Inner	Cap (ppm c					pen Interval E			(ft BGS)		49 🧢 (ft BM)
			ample Pro with				Pump Intake			(ft BGS)		41.5		MP Descripti		
Equipment [cket Rinse with	Liquinox			Depth to Wa	ter Before Pu	ımp Installatio	n (ft BMP);	22-72	Time: 0	747 (P22-11	GW Disposa	l: GW-11 Pon	d
	PURGING		emp. (°C)		oH Units)		nductivity (cm)		ed Oxygen mg/L)		Potential (mV)		bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	I S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(mi)
0926	X	27.28		637		15.7		0.94		-68		95.3		200	427.28	8
0931	~	27.18		6.37		15.2		0.84		-28	1	100 m		200	27.70	1000
0936	X	27.05		6.39		16.1		0.81		-150		45.0		200	22.28	2000
0941	K	26.99		6.39		16.2		0.78		-154		37.4		200	23.25	7000
0946	X	26.87		6.39		16.1		0.77		-157		31.7		200	23.28	4000
0951	×	26.79		6.38		16.1		0.75		-159		285		200	23.28	5000
0956	K	26.78		6.38		16.1		0.74		-160	1	279		200	27.28	6000
04 1001	×	26.79		6.38		16.1		0.73		-162	+	268	-	200	23.28	7404
1						16.1		0.72	1	102		70.8				700
	1			-		1	1				-		T	\$ 8 Z	7/2	
	+			/		1					-		9			
-	++-	-	/	r							-					-
-	-		/						-	-	-					
		-	/				-									
	-	-	/													
2 1 12	<u> </u>		/													
Sample ID:	CQVA	ontainer	D-20170	324	Duplicate ID);					nples/ID:				COC Time:	
30	Materia							Material Co	odes; VOA = 4 intamination;	0 ml glass vi	ial; AG =Ambe	er Glass, CG =			ene; O=Other	(Specify)
Number	Code	Other Property and Publishers	me Pre	servative	Intended	Analysis and	or Method	Comments		TN	Trieto Fillered	1: Y N	COC Numbe	r:		
									n= 0.07	mall				5		47
									0,06 m							25
	In-S	itu Chromi	ium Treatab	ility Study S	Sampling B	ottle Set		Groundwat	er Color is	1816WZ	ren			· .		
								1	CX	0					8	
								Signature	(s):	W	4			3		
			HAVE STABL							- (18.			9
± 0.1 for	pH:	± 3% for	Specific C	onductiv	ity and Te	emperatu	re. ± 10	my for Re	edox Pote	ntial. :	10% for	Dissolved	Oxygen	and Turbi	ditv	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control



NERT, Henderson, NV Project

			realability Study	<u>'</u>	Task Manag	er: Arui Ayy	aswami			Task No: M	112			Well ID: CTI	/IW-02S	
		Richeson	D Keady			= A				Recorded by	y: Jeff Riches c	n DK	d. Kileu	Date: <	24-17	3
Well Depth (ft BGS):		MP Dis	stance AGS ((ft):		Well Depth (ft BMP): 23.	77	Screened/O	pen Interval To	p:		(ft BGS)		9 (ft BMP)
Well Diamete	` '			D Readings (Beneath Inner	Сар (ррт с	ge akb):	-		Screened/O	pen Interval Bo	ittom:		(ft BGS)		4 (ft BMP)
Pump and To	ubing Typ	oe: <u>Hand Bo</u>	ailer Dry	·			Pump Intake	Depth:		(ft BGS)		-	(ft BMP)	MP Description	on: TOC	
Equipment D	econ. Me	ethod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	ter Before Pu	ımp Installatio	n (ft BMP):	12/24	Time:		GW Disposal	: GW-11:Pond	
	PURGING SAMPLING	Т	emp. (°C)	1000210-02-1	oH Units)		onductivity S/cm)	14 SECTION AND A CO.	d Oxygen mg/L)		Potential (mV)	RESTRUCTED AND STREET, N. P.	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
		MEL	-DRY	- UN	ARLE	78	Sant	PLE.								
														ië.		(A*10
								+	8	24.17			•		•	12.00
								0	14							
														22		
												· · · · · · · · · · · · · · · · · · ·				9.
Sample ID:	į.		'		Duplicate ID	_	·			QA/QC Sam	ples/ID:				COC Time:	
STATE!	mple Co Materia							Field Deco	ntamination:		al; AG =Amber Field Filtered:		=Clear Glass; COC Numbe		ne; O=Other (Specify)
Number	Code	Volui	me Pre	servative	Intended /	Analysis and	or Method	Comments Ferrous Iro Sulfide =			DRY				1	
	In-Si	tu Chromi	um Treatabi	lity Study S	Sampling Bo	ottle Set			er Color is	- - - -	04					
± 0.1 for	: :Ha		AVE STABLI Specific C		itv and Te	mperatu		WITHIN: mv for R	edox Pote	ential: ±		issolve MP - Measu			ditv	Sturance

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

<u></u>						OW I L	on an	CONDI	MILI	OAWI L	.IIVG LC	, a		N	EHT, Henders	son, NV Projec
Task Name	In-Situ	Chromium T	reatability Stud	ly	Task Manag	er: Arul Ayy	aswami			Task No: M	12			Well ID: CT	MW-02D	
Field Sampl	ers: Je	Richeson	K. Lew;	D. Keady	/					Recorded by	y: Jeff Riches	on Klar	P. Keady	Date: OS	24/11	. *
Well Depth	ft BGS)	-	MP Di	istance AGS			Well Depth ((ft BMP): 49.	18		pen Interval T			(ft BGS)		34 (ft BMP)
Well Diame	er (in):	2	PID/F	D Readings I	Beneath Inner	Cap (ppm c	ge akb):	-		Screened/O	pen Interval E	ottom: -		(ft BGS)	. ,	49 (ft BMP)
Pump and T	ubing T	ype: QED Sa	ampre Pro (blad	dder) with pol	y tubing		Pump Intake	Depth: -		(ft BGS)		41	(ft BMP)	MP Descripti	on: TOC	
Equipment l	Decon. I	lethod: 3 Bu	icket Rinse with	n Liquinox			Depth to Wa	iter Before Pu	ımp Installatio	n (ft BMP):	23.36	Time: /			l: GW-11 Pond	79
	PURGING	T	emp. (°C)	The second secon	oH Units)	THE RESERVE AND ADDRESS OF THE PARTY.	nductivity S/cm)	EDELECTION PER NOTE.	ed Oxygen (mg/L)	CONTRACTOR AND ADDRESS OF THE PARTY OF THE P	Potential (mV)	Tur	bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time		READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0738	X	26.80	V/°	6-77		14.7		1.65		- s 7		304		200	23 97	0
0743	X	26.54		6.59		15.0		1.14		-106		337		200	23.97	1000
0748	X	26.48		655		15.0		0.97		-/23		195		nee	2399	Zero
0753	X	26.44		654		15.0		0.91		-/34		100		200	23.9.7	3000
0758		26.39		6.55		14.9		0.88		-140		65		200	2397	4000
0803	X	26.38		6.55	A	14.8		0.85	1	-144		53.9		200	23.96	2000
0808	×	26.38		6.56		14.7		0.82	 	-147		47.1		200	23.97	600
0813	×	24.35		658		14.7		0.79		-150		38.7		200	23.97	77000
0818	X	26-33		6.58		14.6		0.71	 	-155		83.7		200	23.91	8000
6823	2	26.31	ļ	6.59		14.6		0.76		759		30.59	1	200	27.97	9000
6878	<	26.31		6.60		14.6		0.75		-163		31.2		Roo	27.97	10000
1	1			0.00		1120		0.75				31.2		-200	-,.1/	10000
	1-1-	<u> </u>								V-24						
		-	/						D	+			<u> </u>			
Sample ID:	29	MU-	02D-201	10924	Duplicate ID	-				QA/QC Sam	nles/ID: A	10 [-11 5	-		COC Time:	2020
S	ample (Container) A () A ()	10027		THE RELEASE	55 (\$ Set 1971)	Material Co			. ,	1/ M.C	-Clear Glass	PE-polyethyl	ene; O=Other (
STATE OF THE	Mate	ial	5.09					Field Deco	ntamination:		Field Filtered		COC Numbe		ste, O-Outer (Specify;
Number	Cod	e Volu	me Pre	servative	Intended	Analysis and	or Method	Comments			<u> </u>					
	-		= "-					Ferrous Iro	n= 0.01	mall						
	lo s	Situ Chromi	ium Trootob	Harriota C	Complies D	-111- 0-1	v	Sulfide =	ter Color is	14						
	111-5	Silu Cilioni	ium Treatabi	ility Study a	sampling B	ottle Set		Groundwat	ler Color is	dellon-du	784A) /					
								Signature	(s):					4		653
*INDICATO	R PAR	AMETERS I	HAVE STABL	IZED WHEN	3 CONSEC	UTIVE REA	ADINGS ARE	WITHIN:	<u>-/-</u>	\						
± 0.1 for	:Ha	± 3% for	Specific C	onductiv	itv and Te				edox Pote	ntial: ±	10% for	Dissolve	d Oxvaen	and Turbi	dity	83
BGS	- Below	Ground Surfa Measuring Pa	ace	C - Centigrad	le	GS - Grou	nd Surface	mg/L - milli	gram/Liter	min - Minu	te	MP - Measu	ing Point	61	QA - Quality As	
DIVIE	- DGIÚW	weasumy P	on it	COC - Chain	or Custody	ID - Identii	ication	mV - milli V	/oits	ml - millilite	er	NTU - Nephi	lometric Units	1	QC - Quality C	ontrol



LOW FLOW GROUNDWATER SAMPLING LOG

							> 11 1 L	on an	JOND I	AILII	OAIIII L	-IIVG LC	u		NE	:HI, Henders	son, NV Project
			hromium Trea			Task Manag	er: Arul Ayy	aswami			Task No: M	112			Well ID: CTM	/W-03S	
			Richeson - d	Di Kead	4. KL	ew				·	Recorded b	y: Jelf Riches	on D.Ke.	dy Klan	Date: 8-	23-17	. 3
Well Depth (ft BG	S):		MP Di	stance AGS	(ft):	-	Well Depth (ft BMP): 24.3	15		pen Interval T			(ft BGS)		19 (ft BMP)
Well Diamet	er (in): 2		PID/FI	D Readings (Beneath Inner	Сар (ррт с	je akb): 🕒			Screened/O	pen Interval B	ottom: -	-	(ft BGS)	;	24 (ft BMP)
Pump and T	ubing	Тур	e: Mega Mor	soon pump	with poly tubi	ng		Pump Intake	Depth:		(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC	
Equipment C	econ	ı. Me	thod: 3 Buck	et Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	22.64	Time: ()	741/8-22+	GW Disposal:	: GW-11 Pond	i
THE CHIEF ST	0	9	Ten	np.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential		bidity	Indeposits and the	and the contract of	Cum. Vol.
	S	급	(*(Units)	M (65			mg/L)		(mV)	ILUNIAR STATE OF THE STATE OF T	ITU)	Purge Rate	Depth to Water	Purged
Time	PURGING	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1318	IX		2739	·	6.41		12.7		1.62		-6		97.4		200	NM	do
1313	X		27.39	· · · · · ·	639		12.6		1.58	-	6		992		200	NA	1000
1328	×		27-85		6-39		12.6		1.54		7		104		200	Nm.	-
1333	X		18.01		6.39		12-5		1.53		21		105	 	200	Nm	7000 7000
13.38			27-86		6.40		12.4		1.53		24		105	 	200	NIM	4000
1343	X		27.94		6 40		12.4		1,53	-	17		105	1	200	NM	5000
1348	×		27.64		6.40		12.3		1.53		14		104		200	Nm	6000
<i>f</i>									,,,,					 		-/-\///	
					1										ŭ:	1	
						1										- 	
_															R*1	127	
_				$\overline{}$		 	<u> </u>									2	
					! <u>.</u>			 						0.1	00.5	7	33
	-	\dashv							 -	<u> </u>				1)6	8-23-1		
Sample ID:	<u>-</u>	יכל	W-035	701	21073	Duplicate ID		<u> </u>	<u> </u>		QA/QC Sam	plac/ID:					।ते
Sa	ımple	Co	ntainer	3 - 20 -	701 /3		e de la companya	ALC: WAS INC.	Material Co				Glass: CG	=Clear Glass:	PE=polyethyle		
1163.3	Ma	teria							Field Decor	ntamination:		Field Filtered		COC Numbe		116, O-Other (c	<u>opecity</u>
Number	C	ode	Volume	Pre	servative	Intended /	Analysis and	or Method	Comments:			,					
									Ferrous Iron	1=0.16 r	79/L						
		. 00	Ob						Sulfide =	0.16 mg/	Z (5	lembra e 4					
	ın	1-511	u Chromiui	m Freatabl	lity Study S	Sampling Bo	ottle Set		Groundwate	er Color is (Loylan A	ind				;	
			 						Signature(10/	A						
INDICATO	R PA	RAI	METERS HA	VE STABL	IZED WHFN	V 3 CONSEC	UTIVE REA	ADINGS ARE				. .		-			
										edox Pote	ntial: ±	: 10% for I	Dissolve	d Oxygen	and Turbic	ditv	
BGS	Belo	w G	round Surface		C - Centigrad			nd Surface			min - Minu		MP - Measu			QA - Quality As	SSUITANCE

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

LOW FLOW GROUNDWATER SAMPLING LOG

									00/10/1	7711611	OAMI I	-ma LC	<u> </u>		N	⊏HI, Henders	son, NV Projec
			hromium Trea			Task Manag	er: Arul Ayy	aswami			Task No: N	112		12.5	Well ID: CT	MW-03D	
Field Samp	ers: ¬	left.	Richeson Dr								Recorded b	y: Jeff Riches	on -D/K	endu Kili	Date: 8	-23-17	
Well Depth					stance AGS ((ft BMP): 39.4	9	Screened/C	pen Interval T	op:	=1	(ft BGS)		34 (ft BMF
Well Diame	<u> </u>					Beneath Inner	Cap (ppm co	ge akb):			Screened/C	pen Interval B	ottom: —		(ft BGS)		39 (ft BMF
			e: QED Samp			tubing		Pump Intake	Depth:		(ft BGS)		37	(ft BMP)	MP Descripti	on: TOC	
Equipment	Decor	ı. Me	thod: 3 Bucke	et Rinse with	Liquinox			Depth to Wa	iter Before Pur	mp Installatio	n (ft BMP):	22-80	Time: 🖋	74218-21	W Disposa	l: GW-11 Pand	1
	PURGING	PLING	Ten (°C			oH Units)	Spec Co	nductivity /cm)	, pou	d Oxygen mg/L)	ORF	Potential (mV)		bid <u>i</u> ty TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time		SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1119	X		28.57		7.42		11.1		1.00/1.19	11 T	-13		16.6		200	23.24	0
1124	X		27,00		7.33		11.7.		0,00/0.86		-28		33.2	<u> </u>	200	23.24	1000
1129	X		26.84		7.33		11.2		0.00/0.81		-28	1	56.0		200	23.24	7,000
1134	V		76.52	,	7.33		11,2		000/0.He		-28	1	59.5	,		23.24	
1139	†⋩		76.57 26.52		7.53		11.2		0.00/0.74		-28	1			200	 	3000
1145	<u> </u>	X		12.00	<u></u>		11-6		0.00/01/		20		54.5		700	2224	4000
1 13	S X STABILIZATION															 	10220
<u> </u>	-	Н					$\overline{}$										
 \-	-				/		`	<u> </u>					<u> </u>				
	-	_															
	Ш				/_								2 }				
													0-3/				1-
	_												V				
	Λ											a	y				
		\Box															
							<u> </u>										
Sample ID:	CT	mi	J-03D	-20170	823	Duplicate ID:					QA/QC Sam	nles/ID:		<u>[</u>		COC Time:	1145
S	mple	Co	ntainer	E41 度指数	NISCON IN THE	LENGTH.			Material Co				r Glass: CG :	=Clear Glass:		ene; O=Other (Specify)
PHO SERVE	THE OWNER OF	teria	ALL THE STREET, STREET							itamination;		Field Filtered		COC Number		, o-outer (e	opoony)
Number	C	ode	Volume	Pre	servative	Intended A	Analysis and/	or Method	Comments:					·	71.7	- 1	
			_		07,11		Called Str.		Ferrous Iron	1= 0.13 n	1/pr				e.		
	<u> </u>							246	Sulfide =	0,09 mg	K	• •					25
	117	1-51	u Chromiun	n Freatabi	lity Study S	Sampling Bo	ottle Set		Groundwate	er Color is	lellow gar	(Su		,	1	*11(33
	_		-						0:	. 2	XXF	_					
*INDICATO	R PA	RΔN	<u></u> METERS HA	VE STABLI	ZED WHEN	I 3 CONSEC	LITIVE DE/	DINCE ADD	Signature(s	s):							
									mv for Re	day Bata	ntial.	100/ 600	Nicoelys-	l Owners	all and the second	-124	
			round Surface		C - Centigrad		GS - Grou		mg/L - millig	_	min - Minu		MP - Measur	l Oxvaen :			Actiones.
			easuring Poin		COC - Chain		ID - Identif		mV - milli Vo		ml - millilit			ing Funit Hometric Units		QA - Quality As QC - Quality Co	

Page \ of \

															130	Titi, Helidela	on, mar mojec
				reatability Study		Task Manag	er: Arul Ayy	aswami			Task No: N	A12			Well ID: CT	MW-04S	100
Field Sampl	ers:_	leff.	Richeson .	D. Kerdy	KILEW						Recorded b	y: Jell Riches	on PY	eadu ki	Date: 87	3-17	1
Well Depth	·			MP Ø	stance AGS (ft): —		Well Depth	(ft BMP): 24.0	1	Screened/C	pen Interval T		71	(ft BGS)		19 (ft BMP
Well Diame		<u> </u>				Beneath Inner			-		Screened/C	pen Interval B	ottom:	-	(ft BGS)	1	24 (ft BMP
Pump and T	ubing	ј Туј	oe: Mega M	lonsoon Pump	with poly tubi	19 Crotech	Gerum	Pump Intake	e Depth:	-	(ft BGS)		23.75	(It BMP)	MP Descripti	on: TOC	
Equipment I	Decor	n. Mo	ethod: 3 Bu	cket Rinse with	Liquinox		77000	Depth to Wa	ter Before Pu	np Installatio	n (ft BMP):	22.89	Time: 0	740/8-22-19	GW Disposal	l: GW-11 Pond	
	PURGING	SAMPLING		emp. (°C)		H Units)	Spec Co	nductivity i/cm)	Dissolve	d Oxygen ng/L)		Potential P (mV)	Tur	bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	旧	SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1005	X		31.14		6.54		12,4		2.0/198		-114		679		7,00	NM	Ø
1010	X		30.57		6.59		11.8		136/172		-(8)		127	E Sec	700	NM	, <i>t</i>
1015	X		31,00		6.59		1).9		0.00/1.70		-234	-	831		200	NM	1900
1020	X		31.17		6.58		11.8		000/1.62		-238	-	77.6		200	Nm	2600
1025	X		31.23				11.8		0,00/1.49		-239		69.9		700	NM	3000 4000
1030	//	X		IL IMPOSTAN	6.58		1110	•	0/4/11/1		251	30	<u> </u>		750	MIL	4,000
1020	-		2100	LIZATION	3									<u> </u>			
	-							 					ļ	1			
 	+	<u> </u>						/_	 			8	1				
					 			1			-	1	P	<u> </u>		<u> </u>	
		-					_/_		<u>U</u>				(S				
<u> </u>		_					/							/			
	/-	_															
	1																
		7															
																	/
Sample ID:	G_{II}	7	4-045	-Z01708	<u> </u>	Duplicate ID					QA/QC San	•			-	COC Time:	1030
S			ontainer													ene; O=Other (Specify)
Number	THE R.	iteria ode	that the second second	me Pre	servative	Intended /	Analysis and	for Mathed	_	ntamination:	Y N	Field Filtered	: Y N	COC Numbe	ar:	W	
Namber	Ī	oue	1 4010	ilip 1 Lie	Servative	intended /	Analysis and	or Metriod	Comments:	-2.05 n	ne/L					9	
	+-								Sulfide = C	1=2.05 p	-				,		
	lr	ı-Si	tu Chrom	ium Treatabi	lity Study 5	Sampling Bo	ottle Set		Groundwate	er Color is	lookethis	tellon			X.		
											1 Ox						
								15	Signature(s):	DX.						
				HAVE STABL										· · ·			
				Specific C											and Turbi		
			around Surfa Measuring P		C - Centigrad COC - Chain		GS - Grou ID - Identii	nd Surface lication	mg/L - millig mV - milli Vo		min - Minu ml - millilit		MP - Measui NTU - Nephe	ing Point Hometric Unit		QA - Quality As QC - Quality C	

	3.				LC	OW FLO	OW GR	OUNDN	VATER	SAMPI	LING LC)G	•	N	ERT, Henders	son, NV Projec
Task Name:	In-Situ	Chromium T	reatability Stud	<u> </u>	Task Manag	er: Arul Ayya	aswami			Task No: N	112			Well ID: CT	MW-04D	
Field Sampl	ers: del	f Richeson -	D. Keady	, K. Len	j					Recorded b	y: Jeff Richos	on D. K.	edy, Kila	Date: 8-Z	3-17	, 1
Well Depth (ft BGS)			stance AGS (ft): ——		Well Depth	(ft BMP): 48.9	9	Screened/C	pen Interval T	op:		(ft BGS)		34 (ft BMP)
Well Diamet				D Readings E			je akb): 🕒		•	Screened/C	pen Interval B	ottom:		(ft BGS)	-	49 (ft BMP)
			ample Pro (blad		tubing / (ح	osvmp	Pump Intak	e Depth:		(ft BGS)		41	(ft BMP)	MP Descripti	on: TOC	
Equipment 0	econ. N	Method: 3 Bu	icket Rinse with	Liquinox			Depth to Wa	ater Before Pur	mp Installatio	n (ft BMP):	23.07-	Time: 0	741(8-72-77)	GW Disposa	I: GW-11 Pond	165 1
	PURGING	Ţ	emp. (°C)		H Jnits)	Spec Co	nductivity /cm)	Dissolve	d Oxygen mg/L)	STATE SHIPS COMPANIES	Potential (mV)	CATENOTINA CANDO A	bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	E S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0742	X	27.06		7,44		12.7		19.04/10.25		-19		49.5		200	23.36	Ø
0747	189		ED: DO	seems to	h hah	pulled	Dumo	1	acd tubin	un 1	man In	prevan	fair -	from lin	e getting in	
0751	X	2732		7.32	0	129	T	3.89/3.37	(7 7	10. 4. 10.	159	-111	200	23.32	1000
0756	*		D; D0 9	0.607	c too ha		TII Cut	line and	ded.	ver; su	Filed .	to George	مام مام	tok pum		7
0832	X	26.42	1 30 3	7.23	100	12.7	71 64	76/7.27		7	7,000	308	The Field	. 200	24.31	.200
0837	X	26.08		7.23		12.7	-	5.27/1.18	7.	-0		258		200	2435	3000
0842	X	25.95		7-22		12.6		1		-19		220			24.39	4000
0847	X	25.88		7.21	-	17.7		0.410.88	-	-39		191	 	200	24.41	5000
0852	V	25.81		7.21		12,7		0,00/0.8	-	-52	-			700	24.41	6090
0857	5		-	7.22				0.0/081		-59		164			34.41	7000
0902	8	26.78	+			12.7	-	1			-	147	-	700		
0907	171	2576		7.2)		12.8	7	0.00 0.78		-64		134		200	24.41	8000
	X	25.71	-	7.21	-/	12.8	/	0,00/0.77		767		124		200	34.41	9000
0912	^	25,19		7.21	-	12.9	V	0.00/0.78	-	-69		117	~	200	24.41	[0 000
0920	7	STA	1127	100		41		/								
	2					OF	8-23-17	4								
			>-2-1708	23	Duplicate ID	: CTMV	1-04D.	70170%		QA/QC San					COC Time: ¿	
36	Mate	Container	CHOSE IFE						odes: VOA = 4 ntamination:						ene; O=Other (Specify)
Number	Cod	Land District Control	ume Pre	eservative	Intended /	Analysis and/	or Method	Comments:		Y N	Field Filtered	: 1 N	COC Numbe	<u>r: </u>		
									n= 0.26 +	my/L						
						-			0,21 r							
	In-S	Situ Chrom	ium Treatab	ility Study S	Sampling Bo	ottle Set		Groundwate			reen, clou	dy				
	ļ								I	NOV		_			1	
	<u> </u>				···			Signature((s):						1/2	
			HAVE STABL							(\geq				6	151
± 0.1 for		± 3% for Ground Surf	r Specific (C - Centigrad							10% for i					
		Measuring F		COC - Chain		ID - Identif	nd Surface ication	mg/L - millig mV - milli V		min - Minı ml - millili		MP - Measu NTU - Nephe	ang Point Hometric Units		QA - Quality A QC - Quality C	



NERT, Henderson, NV Project

														***		2011, 111 1 10,000
			Treatability St		Task Manag	er: Arul Ayya	aswami			Task No: M	112			Well ID: CT	AW-05S	
Field Samp	ers: Je	# Richeson	D. Kord.	KLE	√					Recorded b	y: Jeff-Riches	on DK	dy Kila	Date: 7-	22-17	, 1
Well Depth	(ft BGS):	- MP	Distance AGS	(ft):	-	Well Depth (ft BMP): 24.5	i	Screened/O	pen Interval T		1	(ft BGS)		19 (ft BMP)
Well Diame	ler (in):	2	PID	FID Readings	Beneath Inner	Cap (ppm cg	je akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		24 (ft BMP)
Pump and 1	ubing 1	iype: Mega	Moncoon Pur	p with poly tub	ing		Pump Intake			(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC	71
Equipment I	Decon.	Method: 3 F	Bucket Rinse w	ith Liquinox			Depth to Wa	ter Before Pu	mp Installation	n (ft BMP): 3	23.36 0791	جر Jime:		GW Disposal	: GW-11 Pond	
TE NECES	0	5	Temp.	il girente	рН	Spec Co	nductivity		d Oxygen		Potential		oidity	MEGRANALITA LIP.		Marin Color
	N 0	코	(°C)		Units)	in yas	NAMES AND ASSOCIATION OF THE PARTY AND PARTY.		mg/L)		(mV)	THE RESIDENCE TO A SECURE AND A PARTY.	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	SAMPLING READ	CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1336	X	27.48		6.85		1),8		1.41		135		4.9		200	23.40	9
1341	X	27.64		6.81		11-8		1.01		144		6.8		200	23.42	1000
1346	X	27.86	,	6.82		11.9		0.98		146		6.5		200	23.47	7
1351	X	27.82	<u>, </u>	6.80		11.8		0,94		150		7.2		700	23.73	7000
1356	X	27.68	, , , , , , , , , , , , , , , , , , , ,	, -	/	11.8		0.89	/	151	/	7.4	,	700	23-73	4000
1401	X	27.60		6.79	1	11.8		0.87		151		7.6	V	7.00	2747	FOVO
1410_			B1212A												1.5	
2.00						/		<u> </u>								
						<u></u>					क्श्रे					320
												(5)/7		.7		
		1	1									× / / 7				
					1							\sim		-	F	
		_						927								
Sample ID:	CIN	1W-00	F105-26	277	Duplicate ID					QA/QC Sam	nles/ID:				COC Time:	41-
S	ample	Container	1 100	0000			Die Insta	Material Co			<u> </u>	Glass: CG =	Clear Glass:		ne; O=Other (Specify)
	Mate	# ACT # 101 OF THE # 1	ATTACK OF						ntamination:		Field Filtered		COC Number			opodity/
Number	Coc	le Vo	lume P	reservative	Intended /	Analysis and/	or Method	Comments:					-			
	ļ						18.4=1		1= 0+02 1							
		Situ Chro		Lillia Cando	l Camaliae D				0.00 mg							
<u> </u>	111-6	Situ Cilioi	mium Treata	Dility Study	Sampling Bo	ottle Set		Groundwate	er Color is	erios gri	ζ ή					J
								Signature(st.	4) 1	1					
INDICATO	R PAR	AMETERS	HAVE STAE	LIZED WHE	N 3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:	7				·	<u>- · · · · · · · · · · · · · · · · · · ·</u>		
± 0.1 for	:Ha	± 3% fo	or Specific						edox Pote	ntial: 😉	10% for [)issolved	Oxvaen a	and Turbic	ditv	1
BGS	- Below	Ground Su	rface	C - Centigra	de	GS - Grou	nd Surface	mg/L - millig	ram/Liter	min - Minu	te i	MP - Measuri	ng Point		QA - Quality A	ssurance
אואם	- Delow	/ Measuring	POINT	COU - Chair	of Custody	 ID - Identifi 	ication	mV - milli V	olts	ml - millilita	ar i	VTII - Nenha	Inmetric Linite		DC - Ouality C	ontrol

COC - Chain of Custody ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

	[X]					OW I L	ow and	OUNDY	VAILI	JAINIF L	MVG LC	/G		N	ERT, Henders	son, NV Projeci
			reatability Stud		Task Manag	er: Arul Ayy	aswami			Task No: M	12			Well ID: CT	MW-05D	
Field Sampl	ers: Jeff	Richeson 1	Keady	, K-len	I		100	-		Recorded by	: Jelf Riches	on Dkrac	ly Kilew	Date: 8-2	フート	, 1
Well Depth	(ft BGS):		MP D	stance AGS	(ft):		Well Depth (ft BMP): 54.0	00	Screened/O	pen Interval T	ор:	71	(ft BGS)		34 (ft BMP)
Well Diame	er (in): 2		PID/F	ID Readings I	Beneath Inner	Сар (ррт с	je akb):			Screened/O _j	pen Interval B	ottom:	-	(ft BGS)	!	54 (ft BMP)
			mple Pro (blad		tubing		Pump Intake	Depth: -	-	(ft BGS)		44	(ft BMP)	MP Descripti	on: TOC	
Equipment I	Decon. M	ethod: 3 Bu	cket Rinse with	n Liquinox			Depth to Wa	ter Before Pu	ımp Installatio	n (ft BMP):	23.53	Time:	0740	GW Disposa	I: GW-11 Pond	S.
	PURGING	Т	emp. (°C)		oH Units)	Spec Co	nductivity	12.8/28.08.08.09. vs	ed Oxygen mg/L)	DOLLAR SPRINGS OF ESTIMATOR AS	otential (mV)	Tur	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1041	N	77.18		7.55		11.4		2.05	1 -1	51		30.8		200	Contractor (Section 1)	Ø
1046	X	26.26		7.51		11.5	 					71.7			23.86	7
1051	x	26.00	-	7.50			-	1:03	-	58				200	23.80	000
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					11,5		0.89		43		57.6	<u> </u>	200	23.88	2000
1056	X	25.92		7.50		11.5		0.85	748	46.764		46.7		200	23.88	3000
1/01	X	25,70		7.49		11.5	ļ	0.81	-	12		35.2		200	23.88	4000
1106	<u> </u>	25.76		7.48		11-6		0.80	2	74		<i>33</i> ,1		200	23.88	5000
11/1	У	25.71		7.47		11.6		0.77		77		22,3		200	23.88	4000
1116	ΧL	25.75		7.46		11-6		0.77		81		18.3		200	27-,88	7000
1121	×	25.75		7.47		11.6		0.75		87		16.0		200	23.88	8000
1126	X	25.80		7,47		11.6		0.74		87		11.9		200	Z3.88	9000
1131	X	25,73	/	7.47	/	11,6		0.73		86		10,5		Z∞	23.88	10000
1136	X	25.59		7.47		11-6		0.72		88		9.6	/	200	73.88	1000
1140	X		17.0	7-17-		115.4		0172		.0.6.	-	1.6		200	45100	(1750
11270	1 1	21716	V174770	2									24	13417		<u> </u>
			<u> </u>										-0	157/13		
Sample ID:	COWIN	1.00	70707	3	Duplicate ID					04/00.0	A 1989					11.0
Sample ID.	omnle C	ontainer	2017082		Dubiicare in			Material Co		QA/QC Sam	•		01 01			140
1 12715	Materi								ntamination:		ii; AG =Ambe Field Filtered		=Clear Glass; COC Numbe		ene; O=Other (Specify)
Number	Code	THE RESERVE AND ADDRESS OF THE PARTY NAMED IN	me Pre	servative	Intended A	Analysis and	or Method	Comments		1 14	rieia riileiea	. 1 IV	LCCC Martine	1.		
									n= 0.80 m	3/L						
									0.03 m	/1 '						(6) _
	In-Si	itu Chromi	um Treatab	ility Study S	Sampling B	ottle Set		Groundwat	er Color is Y	blow-gree	H					4
									<u>_</u>	7011						
********								Signature	(s):	TXI	<u> </u>					59
			AVE STABL							6	/					
± U.1 for	DITI:	± 3% tor Ground Surfa	Specific C											and Turbi		
		aroung Surra Measuring Po		C - Centigrad COC - Chain		GS - Grou ID - Identif	nd Surface ication	mg/L - milli mV - milli V		min - Minut ml - millilite		MP - Measui NTU - Nephe	ing Point dometric Units		QA - Quality As QC - Quality C	

I OW ELOW CROLINDWATER CAMPLING LOC

<u></u>						JVV FL	UW Un	OUNDY	VAIEN	SAMP	LING LU	/G		N	RT. Hender	son, NV Projec
Task Name:	In-Situ	Chromium T	Treatability Stud	iy	Task Manage	er: Arul Ayya	aswami		-	Task No: N	112			Well ID: CTI		
Field Sample	ers: Jeff	l Richeson	D. Kendy, 1	لاراوسا					·		y: Jeff-Riches	on Dke	1. 10.0			9 (2)
Well Depth (ft BGS):		MP D	stance AGS ((ft):		Well Depth ((ft BMP): 24.4		Screened/C	pen Interval T	00.	711-00	(ft BGS)	•	19 (ft BMP
Well Diamet	ar (in): 3	2	PID/FI	ID Readings F	Beneath Inner	Сар (ррт со					pen Interval B			(ft BGS)		24 (ft BMP
Pump and T	ubing Ty	/pe: Mega N	Monsoon Pump	with poly tubir	ng / Bai/	,,	Pump Intake	Depth: -		(ft BGS)		24	(ft BMP)	MP Description		ET (IL DINIT
			ucket Rinse with				Depth to Wa	iter Before Pu	mp Installation		23.59		0735	GW Disposal		1
STATE OF	m C	7	emp.	r granteau	Н	Spec Co	nductivity		d Oxygen		Potential			7657F 92575774950	rectable that property	100 100 200 Year
	15 E		(°C)	and the second s	Units)	CARL DRIVEN NO. 40	/cm)	TO RESIDENCE DE NOVA MOUNTE	mg/L)	Charles And Street and Street	Potential P (mV)	STATE OF THE PARTY	bidity ITU)	Purge	Depth to	Cum. Vol.
_ Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE	Rate (ml/min)	(ft BMP)	Purged (ml)
1010	X					,		Lat. 43 Library		LILLAD	ONANGE	NEAD	CHANGE	(111011111)	(ir Divil)	(1111)
	$ \mathbf{x} $	Orian	ie to acl	PENE 10	4 1/0W	W/ pun	p rech	arde to	& Clow.							
1025	1	407	ged 3 ca	Cing V	lumes	(0.21	ga/)	/					ļ			0.21921
1442	*X	3253		Ca 77		13.1	-	6.50		-92		173				1.5 99/
									<u></u>							
	 												10			
										(3)						-
_ \																10
													 			-)
																/
		 											<u> </u>			/
																70
/-		 		/			 									155
	\leftarrow	 	l	/										-, -, -,7/2	<u>}</u>	
													- 4	26822		
S		<u> </u>										DC 15		20	1.	ā.
ample In: (TMI	N-065	-201708	22	Duplicate ID:		-			QA/QC Sam					COC Time:	
Sa	Materi	ontainer						Material Co	des: VOA = 4	0 ml glass vi	al; AG =Ambei	Glass; CG	=Clear Glass;	PE=polyethyle	ne; O=Other (Specify)
Number	Code	March Carrier Street	me Pre	servative	Intended A	\nalysis and/	or Mathed	Comments:	ntamination:	Y N	Field Filtered:	YN	COC Numbe	r:		
	9000	1	1	1	Interrued A	ilialysis alluv	OI IAIGRIPO	Formus Iron	= 2.17	ma/L						1 1
	In-S	itu Chromi	ium Treatabi	lity Study S	ampling Bo	ttle Set		Groundwate	0.33 mg	lack 1	•					
								Signature(s):						1.5	
INDICATOR	1 PARA	METERS	HAVE STABLI	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:		1/						
± 0.1 for	<u>оН:</u>	± 3% for	Specific C	onductivi	itv and Te	mperatu	re: ±10	mv for Re	dox Pote	ntial: ±	: 10% for C)issolve	l Oxygen	and Turbic	lity	
BG2 -	pelow (Ground Surfa Measuring Po	ace (C - Centigrade	е	GS - Grour	nd Surface	mg/L - millig	ram/Liter	min - Minu	te f	AP - Measui	ing Point	(QA - Quality A	ssurance
DIML.	DEIOM I	neasuling Pi	OHIL (COC - Chain	ui Custody	ID - Identifi	cation	mV - milli Vo	olts	ml - millilite	9r	VTU - Nephe	lometric Units		QC - Quality C	

<u></u>		LOW FLOW GROUNDWATER SAMPLING LOG											NERT, Henderson, NV Projec				
Task Name: In-Situ Chromium Treatability Study Task Manager: Arul Ayyaswami Field Samplers: Jeff Richaese D Keady, K. Lew										Task No: A	M12			Well ID: CTMW-06D			
Field Sampl	ers: Jeff	Richeson								Recorded b	y: Jell Riches	on Diken	lu Kilew	Date: 8	-22-17	,	
Well Depth (ft BGS): MP Distance AGS (ft): Well Depth									25	Screened/Open Interval Top:				(ft BGS)		34 (ft BMP)	
Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb):								b): —			Screened/Open Interval Bottom:					54 (ft BMP)	
			ample Pro (blad		y tubing		Pump Intake	Depth:		(ft BGS)		44	(ft BMP)	MP Descripti	on: TOC		
Equipment [Decon. M	ethod: 3 Bu	cket Rinse with	n Liquinox			Depth to Wa	ter Before Pu	ımp Installatio	n (ft BMP):	23.96	Time:	0736	GW Disposa	il: GW-11 Pond	t	
	PURGING SAMPLING	J	Temp. (°C)		pH (pH Units)		Spec Conductivity m (áS/cm)		Dissolved Oxygen DO (mg/L)		Redox Potential ORP (mV)		Turbidity (NTU)		Depth to Water	Cum. Vol. Purged	
Time	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)	
0821	X	29.32	1	6.96		13.)		1,63		-20		353		200	24.31	200 Ø	
0826	X	29.38		6.91		13.2		0.29		-11		156		200	24.34	Bara 1000	
0831	X	26,33		6.90		13.2		0.00		-4		139		.200	24.35	Hos 2000	
0836	X	26.32		6.89	<u> </u>	13.2		2.36*		-6	 	120		200	24.35	\$200 300s	
0841	X	26,22		6.88		13.2		1.52		-13		99,3	1	200	74.35	1000400	
0846	X	26,18		6.88	i	13.2		1.27		-13	 	101	1	700	24.35	1262 5000	
0851	X	26.13		6.88		13.2		1:13		-10	 	28.5		200	24.35	Mag coo	
0886	×	2616		6.88		13.2		1.06		-5		80.1		200	24.35	7-000	
0901	×	26.14		6.88		13.3		1.03		- /		5.7.6		200	24.75	8000	
0906	X	26.11		6-88	 	13.3		0.98	-	4		49.9			24.35	9000	
0911	X	26.10	,	687	/	13.3	,	0.93	/	8	,	46.1		200	24.35	10000	
0916	×	26.14		6.86		13.3		0.90	1	11	1	465		200	24.35	11 000	
0920	X	1	INZAT														
1					- 6					ak o							
										07	2/17						
Sample ID:		J-06D-2	0170822		Duplicate ID):	•			QA/QC San	nples/ID: -		-	F.#	COC Time: (297.0	
Sa		ontainer	11 10 1												lene; O=Other (
Mumban	Materi	DALL SOURCESSAN	D-						ntamination:		Field Filtered		COC Numbe	or:		ballor II wa	
Number	Code	Volu	me i Pre	eservative	Intended	Analysis and	or Method				mba Doto v	AZE DO D	robe.				
								Cultida _	0.00 m	211							
	In-S	itu Chrom	ium Treatab	ility Study :	l	ottle Set		Groundwai	ter Color is	ellow-2	veen -					92	
				,,					ب المالون المال	1) \			Y	,	45	
								Signature	(s):	<u> </u>				7).	56		
			HAVE STABL					WITHIN:			()		,	(T)	25.2	Y ₀	
			Specific C								± 10% for I			and Turb			
BGS - Below Ground Surface C - Centigrade GS - Ground Surface BMP - Below Measuring Point COC - Chain of Custody ID - Identification							mg/L - milli mV - milli \		min - Mini ml - millilit		MP - Measur NTU - Nephe	ring Point elometric Units	s '	QA - Quality A QC - Quality C			



WELL WATER LEVEL MEASUREMENT LOG

Page _ l of _

Task Name: In-Situ Chromium Treatability Study	Task No: M12	3	Date: 9/19/17
Task Manager Arul Ayyaswami	Field Sampler(s): Jeff Richeson, D. Kendy		Recorded by: Jeff Richeson, 1 Ka
Equipment Model/Type:	Serial Number:		Last Calibration Date:
Solinst IP 12Z	027681 (Pine)		

	Describe Measuring	Time	Depth to Static Water Level	Well Sounding Depth	Condition of Well and
Well Identification	Point	(hrs)	(ft BMP)	(ft BMP)	Well Seal
CTIW-01S	тос	1070	25,33		Cap stuck on well-
CTIW-01D	тос	0653			Interphase Cont 1
CTIW-02S	тос	0655	<i>></i>		injectate in well
CTIW-02D	TOC	0657	72,75		(5000
CTIW-03S	TOC	0158	22,50		Good
CTIW-03D	TOC	0700	24,11		G-00d
CTMW-01S	TOC	0644	22.85		Good
CTMW-01D	TOC	0645	23,77		Caped
CTMW-02S	тос	0642	23.21		GOOD TD=23.70
CTMW-02D	TOC	0643	23,40		Good
CTMW-03S	тос	0640	22,73	_	Good
CTMW-03D	TOC	0641	22.88		Good
CTMW-04S	TOC	0638	22,90		Good
CTMW-04D	TOC	0639	23.13		610d.
CTMW-05S	TOC	0636	23.38		6000
CTMW-05D	TOC	0637	23.56	_	6000
CTMW-06S	TOC	06334	23.64		Good
CTMW-06D	TOC	0633	23.45		Good
			-		
· · · · · · · · · · · · · · · · · · ·					
				17	
<u>.</u>			1	9-19	
,			INT.	C-1611	
			17		
			<u> </u>		
			ļ. l		

NERT, Henderson, NV Project

							JVV TL	JW GIT	JONDII	AILII	JAINII L	.IIVG LU	<u>u</u>	- 53:35			ion, NV Projec	
Name and Address of the Owner, where the Owner, which is the Owner, where the Owner, which is the Owner	ask Name: In-Situ Chromium Treatability Study Task Manager: Arul Ayyaswami										Task No: N				Well ID: CTMW-01S			
Field Samplers: Jeff Richeson, D. Keady											Recorded by: Jeff Richeson, D. Kandy					Date: 9/20/17		
								ft BMP): 23.7	8	+	pen Interval T		/	(ft BGS)				
								Screened/Open Interval Botton			ottom: -	_	(ft BGS)	· 2	4 (ft BMF			
Pump and Tubing Type: Mega Monsoon Pump with Poly Tubing Pump Intake								mp Intake Depth: (tt BGS)			23.5	(ft BMP)	MP Description: TOC					
Equipment D	econ	ı. Me	thod: 3 Bud	ket Rinse with	Liquinox			Depth to Wa	ter Before Pur	mp Installation	n (ft BMP):	2.85	Time: (1)	<u>//2/27/24</u>	GW Disposa	: GW-11 Pond		
	PURGING	PLING		emp. °C)		H Units)	Spec Co	nductivity i/cm)	Dissolved	d Oxygen mg/L)	Redox Potential ORP (mV)		Turbidity (NTU)		Purge Rate	Depth to Water	Cum. Vol. Purged	
Time	ᄩ	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)	
0804	X		27.87		6,50		12.6		203/03		-57		136		100	22.96	Ø	
P080	X		28 85		6.43		1243		132/0.18		-64		77.9		100	23.00	200	
1180	X		79.56		6.43		12-2		1.00/0.15		-68		45-2		100	23.05	1000	
0819	X		30.22		6.43		12.2		0.04/0.14		-71		36.4		100	23:15	1500	
0824	X		30.56		6.41		123		0.74/013		-72		35,6		100	23.24	7000	
0829	V		30.84	/	6.40	1	12.4	1	0.70/0.15	V	-72	V	34.7	V	100	NM	2500	
0830	^	X		HZATION	Ø1-(U		161	-	Citolous		10		201					
0830	+	~	المارات	THILD!	-							-						
_	+		_			/		-				-					1/	
-	-	-				/										-	*	
	+					/		-		1		-				/		
	-				-/		-		-			-		-		-		
-		-			/	-					1	-						
		-						-	-			7.		-	/			
	1					-	-					delk	7/20	174 /				
													1/20	1				
Sample ID:	C	MI	N-DIZ	2017092		Duplicate IC):		100000	1 1/01	QA/QC Sar	Programme Charles	-0100	Olean Olean	OC - almathus	COC Time:		
S	Sample Container Material								Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number:									
Number		atena Code		me Pre	servative	Intended	Analysis and	l/or Method	Comments		1. 11	I leid i litered	2. (19	TOOC HUILD	91.			
THUMBOI	T	2000	1000						1	214								
	1	n-Si	tu Chrom	ium Treatabi	lity Study	Sampling B	ottle Set		Sulfide=	0.49 m	2/L	yellow-						
	T								Groundwai	er Color is	blackish	yellow-	green			30		
							0-00		11	1)	711		/					
						1.0000		24	Signature	(s):	1							
				HAVE STABL							(1	122 3/2	E. 15					
				Specific C												igity		

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control

LOW FLOW GROUNDWATER SAMPLING LOG

Page / of \

IERT, Henderson, NV Project

				1			JVV FL	שני שני	JUNDY	MILII		.IIVG LO	<u>u</u>				SOII, INV Project
Task Name:	In-S	tu C	hromium Tr	eatability Stud	у	Task Manage	er: Arul Ayya	aswami			Task No: M				Well ID: CTI		
Field Sample	ers: .	leff F	Richeson , †	xkeady	···		<u>-</u> -,				Recorded by	: Jeff Richeso	on, Dike	ndy	Date: 9	120/17	·
Well Depth (MP Di	stance AGS (ft): —	<u>-</u>	Well Depth (ft BMP): 49.4	И	Screened/O	pen Interval To	op: =		(ft BGS)		34 (ft BMP)
Well Diamet	er (in)	: 2		PID/FI	D Readings E	Beneath Inner	Cap (ppm co	je akb): -			Screened/O	pen Interval Bo	ottom:		(ft BGS)		49 (ft BMP)
Pump and T	ubing	Тур	e: QED Sai	mple Pro with	Poly Tubing		(4)	Pump Intake	Depth:		(ft BGS)		41.5	(ft BMP)	MP Description		
Equipment D	Эесоп	. Me	thod: 3 Bud	ket Rinse with	Liquinox			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	23,77	Time: 🐧	642(9/19/17)	GW Disposal	: GW-11 Pond	<u> </u>
S. M. usi S.	Len	5	Te	mp.	110,111	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turk	bidity	Purge	Depth to	Cum. Vol.
Omes I vi	I S	N.		*C)		Jnits)	MUS				A CAPTURE OF THE REAL PROPERTY.	(mV)		TU)	Rate	Water	Purged
Time	PURGING	SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	N-2-YS	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0639		(7)	25.48		651		14.7		1.71/0.26		-63		104		200	73.25	Ø
0644	X		2575		6.46		15.0		0.23/0-23	1	-83		26.0		200	23.65	1000
0649			25.74		653		14.8		0.09/0.24		-91		21.0		200	23.68	7,000
	₩				6.57	-	14.7		0.010.23		-96		18.3	1	200	23.70	7000
0654			25.69	<u> </u>	6.54	<u> </u>	14.7	 	0.00 0.22		-96		17.0	<u> </u>	7.00	73.72	4000
0659	X		25,69		· · · · · · · · · · · · · · · · · · ·		- ` · · ·		- 1.		-98		15.5		200	23.74	5000
0704	X	_	25.68		6.54	\ <u>\</u>	14.7	1	0.00 0.22	·		7		- ×	200	23.74	6000
0709	X		25.68		6.53	- '	14.7-	V	0.00/0.21	- V	-99	-	14.7	V -	 	73.78	7-000
0714	X		25.67		6.53	l	14.6		0.00 /0.21	 ,	-100		13.6		200		2000
0719	X	_	25.67		6.54	J	14.6		0.00/0.2	! /	-102	I	15.2		200	23.80	
0724	X		25.48	√	6.53		14.6		0,01 0.2		-103	✓	11.5	V	Zao	23.82	9000
0725		X	Smill	ZED AT (704 BUT!	VRGED F	OR ADDIT	10NAL Z	MINUTE	Ar Pu	TRUTED.			ļ		ļ	
											0					ļ	
														- W	V29/13		
	1														742		
	T																
Sample ID:	CI	MI	N-01D	-20170	\$920	Duplicate ID):	<u>'.</u>			QA/QC San	ples/ID:				COC Time:	0725
			ontainer	17.					Material C	odes: VOA =	40 ml glass vi	ial; AG =Ambe				ene; O=Other	(Specify)
	Ma	ateria							Field Deco	ontamination:	Y N	Field Filtered	l: Y N	COC Numb	er:		
Number	(ode	Volu	me Pr	eservative	Intended	Analysis and	l/or Method	Comment								
						ļ			Ferrous tr		17						
								·	Sulfide =	0.06 m	g 14						
	- I	n-Si	tu Chrom	ium Treatab	oility Study	Sampling B	ottle Set		Groundwa	iter Color is	yellow-g	icen				•	
									.		RD (1)	-					
*INDICATO	ם פר	A D A	METERS	<u> </u>	I IZED WILE	N 3 CONSE	CLITIVE DE	ADINGS AD	Signatur	(0)					20.5		
										edox Pot	ential:	+ 10% for	Dissolve	d Oxvaer	and Turb	idity	
			# 3 /0 101													OA - Ouglity	A

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control

LOW FLOW GROUNDWATER SAMPLING LOG

						L	JVV I L.	JW GA	COND	MILIT	DAINII L	mu Le		_	INC	:n i, nelideis	son, NV Project
Task Name:	In-Site	. Chromiu	m Treata	bility Study	i	Task Manage	er: Arul Ayya	aswami			Task No: M	12			Well ID: CTM	/	
Field Sample	ers: Je	ff Richeso	ກ								Recorded by	: Jeff Riches	on		Date: 9 2	-/17	
Well Depth (t BGS): —		MP Dis	tance AGS (I	ft):	_	Well Depth ((ft BMP): 23.7	7	Screened/Or	en Interval T	op:		(ft BGS)	· · · · · · · · · · · · · · · · · · ·	19 (ft BMP)
Well Diamet	er (in):	2		PID/FI) Readings E	Beneath Inner	Сар (ррт со	ge akb):			Screened/Op	oen Interval B	ottom: -		(ft BGS)		24 (ft BMP)
Pump and T	ubing "	Type: Har	id Bailer					Pump Intake	e Depth:		(ft BGS)			(ft BMP)	MP Description		
Equipment C	econ.	Method: 3	3 Bucket	Rinse with	Liquinox			Depth to Wa	iter Before Pu	mp Installation	(ft BMP):	23-21	Time://G	42(1)19/17	GW Disposal	GW-11 Pond	
	m	<u> </u>	Temp	o. III		oH	Spec Co	nductivity	Dissolve	d Oxygen	Redox F	Potential	Turk	oidity	Purge	Depth to	Cum. Vol.
	흥	1	(.c)			Units)	(uS	i/cm)	DO (mg/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time	PURGING	SAMPLING SAMPLING SAMPLING	D C	HANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1345	è 1		I NA	BAILE	N NE	70 AV	EFICI	LATT LA	ATTER 8	aum	1/5202	DE CH	ARGE				
- -/- -		711	1/40 2		2_0/=	70 270	Un LUI	101	-1		7_5266	<u>~</u>	111				
						-								<u> </u>			
-						 											
1								 /	ļ		\	<u> </u>	<u> </u>	<u> </u>			
														ļ			
\								 /	<u> </u>	<u> </u>	\						<u> </u>
100 0.00	<u> </u>		_					<u>/</u>									
	$\perp \perp$						/	1									
															<u> </u>		
												7					
							/					Ò	4				
							/	-			iii.		1/-	/			
								 	<u> </u>				X	0/17			
	 -	>				/											
			-/-										<u> </u>	-			
Commis ID:		70.0		2 (7)	3-	Duplicate ID	\.				QA/QC Sam	nloc/ID:	<u> </u>		<u></u>	COC Time:)775
Sample ID:		Containe		-20170	1726	Duplicate ic);	-	Material C	odes: VOA =		•	or Glace: CG	-Clear Glass:	PE=polyethyle		1 2 1
3	•	erial	71	-		1				intamination:		Field Filtered		COC Numbe			(Openity)
Number			Volume	Pre	servative	Intended	Analysis and	I/or Method	Comments		, ,,	11 1010 1 1110101		rooo namo			
	Ī								Ferrous Iro								
	1							<u>-</u>	T leutide -	ALC:		6					
	In	Situ Ch	romium	Treatabi	lity Study	Sampling B	ottle Set		Groundwa	ter Color is &	sackish	Yellow	Aree	j			
									11		\mathcal{N}	N .	0				
								····	Signature	e(s):	175	7		 	100		
						N 3 CONSE				-	0						
± 0.1 for	:Hq	± 3%	for Sr	<u>oecific C</u>	onductiv	<u>∕itv and T</u>									and Turbi		
		w Ground			C - Centigrad			und Surface		igram/Liter	min - Minu		MP - Measu			QA - Quality A	
BMP	- Belo	w Measur	ng Point		COC - Chair	n of Custody	ID - Ident	itication	mV - milli '	VOIIS	ml - millilit	er	NIU - Neph	elometric Unit	5	QC - Quality (Jontroi

Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number:	-					L	OW FLO	OW GR	OUNDV	ATER	SAMPL	.ING LC)G		N	ERT, Henders	son, NV Projec
Mell Depth (H GGS)	Task Name:	In-Situ	Chromium T	reatability Stud	у	Task Manag	er: Arul Ayya	aswami			Task No: M	112			Well ID: CT	MW-02D	
Mel Depth (It BAS)	Field Sample	rs: Jeff	Richeson	D. Kerly							Recorded b	y: Jeff Riches	on D E	Leady	Date: 9	120/17	L
Pump Intake Depth: Pump Intake Pump Intake Pump Intake Pump Intake Pump Intake Pump Intake Pump Intake Pump Intake Pump Intake Pump In				MP Di	stance AGS (ft): —		Well Depth ((ft BMP): 49.1	8	Screened/C	pen Interval T	op: —		(ft BGS)	<i>() '</i>	
Depth to Water Before Pump Installation (ft BMP); 23, 40 Time: 6412 (474) GW Disposal: GW-11 Pond	Well Diamete	er (in): 2	2	PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	je akb): 🕒			Screened/C	pen Interval B	ottom:				49 (ft BMP
Temp.	Pump and Tu	ibing Ty	pe: QED Sa	ampre Pro (blad	ider) with poly	tubing		<u> </u>			· · · · · ·						
CAST 13.2 0.79/AM 39 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.17	Equipment D	econ. M	lethod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	ater Before Pu	mp Installation	n (ft BMP): Z	3.40	Time: 06	43 (4/19/17	GW Disposa	l: GW-11 Pond	1
CAST 13.2 0.79/AM 39 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.16 0.70/AM 200 24.17	T.	GING	T		1				The state of the s	THE RESERVE TO SHARE THE PARTY OF THE PARTY	The second second		The second secon	The second secon		Water	
CAST 13.2 0.79/A 39 200 24.16 0.90/S 25.94 6.92 13.6 0.05/B.17 4/6 6.98 200 24.18 6.90 15.6 0.05/B.17 4/6 6.98 200 24.18 6.90 24.15 6.90 15.6 0.00/S 25.77 6.91 17.16 0.00/S 19.10 52 36.8 200 24.15 200	Time	E SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	
O SO X 25,94 6,92 13,6 0.05]0.17 4/6 698 200 24,34 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 1	1945		à .	TAS	6.87		13.2		0.74/2.16		39		>(000		200	24.16	Ø
OS					6.92		13.6		0.0570.17		46		698		200	24,34	1000
DOO X 75.64 G.90 IS.6 D. V. O.14 58 199 Zeo 74.50 Table		X	25.70		1				0.00/0.14		52		368		700	24.48	7,000
1005 X 25.66 G.89 3.6 0.00/0.15 G.1 158 200 24.52 4eeo 1010 X 25.43 4.87 13.7 0.00/0.15 4.4 118 200 24.57 5000 1015 X 25.58 (0.88 13.5 0.00/0.14 96 83.8 2.00 24.58 60.00 1025 X 25.55 (0.87 13.4 0.00/0.13 660 62.11 2.00 24.59 7000 1026 X 25.55 4.86 13.4 0.00/0.13 660 62.11 2.00 24.59 7000 1026 X 25.57 4.86 13.3 0.00/0.12 64 50.0 2.00 24.60 7000 1026 X 25.57 4.87 13.3 0.00/0.12 64 50.0 2.00 24.60 7000 1027 X 25.57 4.88 13.5 0.00/0.12 64 50.0 2.00 24.60 7000 1028 X 25.57 4.82 13.3 0.00/0.12 64 50.0 2.00 24.60 10.00 1029 X 25.57 4.82 13.3 0.00/0.12 57 4.55 2.00 24.60 10.00 1040 X 25.57 4.82 4.83 4.33 4.00/0.12 52 46.5 2.00 24.60 10.00 1050 X 25.55 4.82 4.83 4.33 4.00/0.12 52 46.5 2.00 24.60 10.00 1050 X 25.55 4.82 4.83 4.83 4.80 4.80 4.80 4.80 4.80 1050 X 25.55 4.82 4.83 4.83 4.80 4.80 4.80 4.80 4.80 1050 X 25.55 4.82 4.83 4.83 4.80 4.80 4.80 4.80 4.80 4.80 1050 X 25.55 4.82 4.83 4.83 4.80 4.80 4.80 4.80 4.80 1050 X 25.55 4.82 4.83 4.83 4.80 4.80 4.80 4.80 4.80 1050 X 25.55 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.80 4.80 4.80 1050 X 25.55 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 1050 X 25.55 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 1050 X 25.55 4.83		X			6.90		1 1 2								200	74.50	7000
D 0		X							-						200	1	-
D													18			24.55	1 '
1025 X 25.55 C.87 13.4 0.06 0.13 Co Co Co Co Co Co Co C		X			_										200	24.58	1 -
1025 X 25.55 C.866 13.4 D.(D 0.1) Ge 50.2 700 24.60 900 1030 X 25.54 C.87 G.83 13.3 D.00 0.12 G4 50.0 200 24.60 1000 1035 X 25.54 G.83 I3.3 D.00 0.12 G4 50.0 200 24.60 1000 1040 X 25.54 G.82 I3.3 D.00 0.12 58 V 5/.2 Z00 Z4.60 1000 1045 X 27.54 V G.83 V I3.3 D.00 0.12 52 46.5 Z00 Z4.60 1200 1050 X 25.55 V G.82 V I3.3 D.00 0.12 52 42.9 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 53 31.2 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 53 31.2 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 53 31.2 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 53 31.2 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 53 31.2 Z00 Z4.60 13.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 Z00 Z4.60 I3.00 1050 X 24.55 V G.82 V I3.3 D.00 0.12 S3 S1.2 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 V I3.3 D.00 0.12 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00 D.00	1020	Y							1						200	24.59	
D30		X							7		1				200	1	1
1035 X 25.54		X									64				7.00	1 1	
1040 X 25;57		X		1				V		1	1		47.3				
1045 X 25.55 V 6.82 V 15.3 D.60 0.12 52 V 46.5 Zoo 24.60 12 oco 1050 X 25.55 V 6.82 V 15.3 D.60 0.12 53 Zoo 24.60 13 coo 1050 X 24.55 V 6.82 V 13.3 D.60 0.12 Sample ID: TIM - 0 2 D - 2017 0 9 20 Duplicate ID: Duplicate ID: QA/QC Samples/ID: Leve 1 4 QC COC Time: 1(00 Sample Container Material Number Code Volume Preservative Intended Analysis and/or Method Intende		X		1	_					1		V,			200	1	
1050 X 25.55 6.82 13.3 0.00 0.12 53 39.2 200 24.60 13.00 1055 24.55 42.55		X		J		V		1						J		1	12000
ample ID: TINW - 0 2 D - Zol 7 oq 2 0 Duplicate ID: Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Stabilization at 1035, bt project for all 1. Zomins, as introduct; sample Personal Ferrous Iron= NS Sulfide = 0, 0 2 mg/l Groundwater Color is Yellow - green Signature(s): NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		X		- /	6.02						+	1		1			-
Ample ID: CTOW - 0 2 D - 20170920 Duplicate ID: Sample Container Material Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: \$\frac{1}{2} \text{Ab-1} \text{Tartion at 1035}, bt proped for all 1. 20 mins. as in throckel; sample 11000 Ferrous Iron= NS Sullide = 0, 0 2 mins. Groundwater Color is Yellow - green Signature(s): NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		X	24.55		6.82			V								· · · · · · · · · · · · · · · · · · ·	
Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Stabilization at 1035, but purged for all 1. Zomins. qs instructed; sample 1100 Material Material Material Material Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Stabilization at 1035, but purged for all 1. Zomins. qs instructed; sample 1100 Material	Sample ID:	CIV			_	Duplicate II						nples/ID:		QC			1(00
Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments: Stablization at 1035, bt project for additional comments and comments are stablized for additional comments. Stablization at 1035, bt project for additional comments at 1035, bt project for additional comments and comments are stablized for additional comments. Stablization at 1035, bt project for additional comments and comments are stablized for additional comments. Stablized for additional comments are stablized for additional comments and comments are stablized for additional comments. Stablized for additional comments are stablized for additional comments and comments are stablized for additional comments. Stablized for additional comments are stablized for additional comments and comments are stablized for additional comments. Stablized for additional comments are stablized for additional comments and comments are stablized for additional comments are stablized for additional comments and comments are stablized for additional comments and comments are stablized for additional comments. Stablized for addi						Melle			Material C	odes: VOA =	40 ml glass v			ALCOHOL: NAME OF TAXABLE PARTY.	PE=polyethy	lene; O=Other	(Specify)
In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide = 0,02 mg/ Groundwater Color is Yellow - green Signature(s):	5 1 31	Mater				W.E											
In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide = 0,02 mg/ Groundwater Color is Yellow - green Signature(s):	Number	Cod	e Volu	ume Pr	eservative	Intended	Analysis and	Vor Method	Comments	Stabiliz	ation at	1035, L	t purged to	or addi. 20	Mills. 95 il	structed; sa	inplud@1100
In-Situ Chromium Treatability Study Sampling Bottle Set Groundwater Color is Yellow - green Signature(s): Signature(s):									Ferrous iro	n= N 2	A =		•		,		
Signature(s): NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		lo S	Situ Chrom	nium Trootoh	sility Study 9	Sampling F	lottle Set					4=Da. 4					
INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		111-6	Situ Criton	iluiti ileatat	inty Study	Sampling	ottie Set		Giodilowa	iei coloi is	Ichan a	Acen				1	
INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		ļ					_		Signature	e(s):	ナイス				,		· .
	*INDICATO	R PAR	AMETERS	HAVE STABI	LIZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF			()		2.53				- 7
E U. 1 TO DIT. E 3 % TO SDECIFIC COMMUNICATION TEMPERATURE. E TO INVIOL DISSOTTEM OXIVILIATION TO THE TOTAL TO THE STATE OF THE STATE O										edox Pote	ential:	± 10% for	Dissolve	d Oxvaen	and Turb	idity	

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name: In-Situ Chromium Treatability Study Task Manager: Arul Ayyaswami Task No: M12 Recorded by: Jeff Richeson , D. Keady Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 24.35 Well Diameter (in): 2 Pump and Tubing Type: Mega Monsoon pump with poly tubing Task No: M12 Recorded by: Jeff Richeson , D. Keady Date: Date: 9 / 2 / 1 / 7 Well Depth (ft BMP): 24.35 Screened/Open Interval Top: (ft BGS)
Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 24.35 Screened/Open Interval Top: (ft BGS) 19 (ft B
Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 24.35 Screened/Open Interval Top: (ft BGS) 19 (ft BGS)
Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) 24 (ft B
Pump and Tuhing Type: Mars Manager rump with poly tuhing Pump Intake Denth: (ft BGS) 23.75 (ft BMP) MP Description: TOC
If drip date record Type, the party to the p
Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (ft BMP): ZZ-73 Time: 0640(9/19);7]GW Disposal: GW-11 Pond
(*C) (pH Units) 1/4 (u/S/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged
Time Temp. pH Spec Conductivity Dissolved Oxygen Redox Potential Turbidity Purge ("C) (pH Units) TM (MS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water (ml/min) (ft BMP) (ml)
0809 × 25.46 6.94 10.5 2.35/0.37 57 10.5 180 22.77 0
0814 X 25.26 6.84 10.5 0.94/0.24 62 4.4 180 22.77 900
0829 X 25.30 V 6.87 V 10.6 V 0.35/010 V 67 V 2.1 V (45) 180 22.77 3650
0830 X STABILIZATION
Sample ID: CTMW-035-70170971 Duplicate ID: — QA/QC Samples/ID: COC Time: D) 30
1 0 1 1 0 0 0 0 0 1 1 1 1
Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number:
Number Code Volume Preservative Intended Analysis and/or Method Comments:
Ferrous Iron= NS
Sulfide = 0,12 mg/L
In-Situ Chromium Treatability Study Sampling Bottle Set Groundwater Color is Vellow - green
Signature(s):
*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 mv for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity
BGS - Below Ground Surface C - Centigrade GS - Ground Surface mg/L - milligram/Liter min - Minute MP - Measuring Point QA - Quality Assurance BMP - Below Measuring Point COC - Chain of Custody ID - Identification mV - milli Volts mI - milliliter NTU - Nephelometric Units QC - Quality Control

					L	JVV FL	JW GR	UUINI	JVVAIC	h dain	IPL	ing Lu	G		NI	ERT, Henders	son, NV Project
Task Name:	In-Situ	Chromium T	reatability Stud	у	Task Manage	er: Arul Ayya	swami			Task N	lo: M1	12			Well ID: CT		
Field Sample	ers: Jeff	Richeson,	DiKeady	/	· 					Record	ded by:	: Jeff Richeso	n, D, K	eady	Date: 9	21/17	
Well Depth (stance AGS ((t): —		Well Depth (ft BMP):	39.49	Screen	ned/Op	en Interval To	p:	_ /	(ft BGS)		34 (ft BMP)
Well Diamet	er (in): 2	2	PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	e akb): -			Screen	ned/Op	en Interval Bo	ottom: —		(ft BGS)		39 (ft BMP)
Pump and T	ubing Ty	pe: QED S	ample Pro (blad	lder) with poly	tubing		Pump Intake	Depth:	_	(ft BGS	S)		37	(ft BMP)	MP Descripti	on: TOC	
Equipment D	econ. N	lethod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	iter Befor	Pump Install	ation (ft BMF	P): 2	22.88	Time:	0641	GW Disposa	: GW-11 Papa	
	(n C	Т	emp.	5 3 1	н	Spec Co	nductivity	Disso	lved Oxyg	en Rec		Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
			(°C)		Jnits)	m (ús		THE CASE OF THE PARTY OF	O (mg/L)			(mV)		ITU)	Rate	Water	Purged
Time	PURGING SAMPI ING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA	CHANG	SE* REA	AD	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0915	VI	24.73		7.50		9.91		1.50/	p. [3]	8			_1(3_	i i	140_	23.04	Ø
0920	$+ \bigcirc +$	24.45		7.58		9,90		0.42		4			7.3		140	23.04	700
	 	24.3	<u>}</u>			9,90		0.13/		7			3,5		140	23.04	1400
0925	 		4	7.58				L III	-1					<u> </u>		23.04	
0930	- -	24.31		357	/	9.90	<i> </i>	0.00/0				/_	1.6		140		-2100-
0935	X	24.20		7.58	V	9.91	V	0.00	0.12	7	1			V (45	140	23.04	7.800
0940		STAB	ILIZATION		ļ								-		-		
			<u> </u>														<u> </u>
					<u> </u>												
	- -															1	
1				1													
\														1	1		
	\- -		 	<i> </i>				-			/-			9/21	1		
	1-1/-			/									· P		<u> </u>	-	
		—		<u> </u>	ļ								- CP1	_	-	ļ	<u></u>
				1			<u> </u>										
			>-20176	121	Duplicate ID	:		1				ples/ID:				COC Time: 4	1 1 7
S		Container						9						=Clear Glass	; PE=polyethyl	lene; O=Other	(Specify)
Number	Mate	Luci.	ume Pre	eservative	Intended	Analysis and	for Mathod	Comm	Decontaminati	on: Y r	ן או	Field Filtered	T IN	COC NUMB	er:		
Number	Cod	1 401	ulile Fit	SSELVATIVE	intended /	Analysis and	OI Menton		is Iron= NS								
					 			Sulfide	(20.0 = E								
	.l	Situ Chron	nium Treatab	ility Study !	Samoling B	ottle Set		Groun	dwater Color i	allage	MV	green				•	
	T		The first of the f	inty Olday		01110 001				Tom	($\mathcal{O}_{\mathcal{I}_{i}}$					
	-				ļ			Sign	ature(s):	1)	20	-				
INDICATO	R PAR	AMETERS	HAVE STABL	IZED WHE	N 3 CONSEC	CUTIVE RE	ADINGS AR				,	0					
± 0.1 for	:Ha	± 3% fo	r Specific (Conductiv	ity and Te	emperatu	ire: ±10	mv fo	r Redox F	otential:	<u>: ±</u>	: 10% for	Dissolve	d Oxvger	and Turb	iditv	
		Ground Sur		C - Centigra			ınd Surface		milligram/Lite		- Minu		MP - Measi			QA - Quality	Assurance

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

						L,(JVV FL	JW GH	UUNL	JW	AIEH	SAMPL	ING LU	u		N	ERT, Henders	son, NV Project
Task Name	: In-Sil	u Cl	hromium Ti	reatability Stud	у	Task Manag	er: Arul Ayya	ıswami				Task No: M	112			Well ID: CTI	MW-04S	
				D.Kerdy								Recorded b	y: Jeff Riches	on , D, K	rady	Date: 9	121/17	
Well Depth	(ft BGS	3):		MP Di	stance AGS (ft): —		Well Depth ((ft BMP):	24.01		Screened/C	pen Interval T	op: -	_ '7	(ft BGS)	7 7	19 (ft BMP)
Well Diame	ter (in):	2	_Cluck	Peristally consount Pump	D Readings E	Beneath Inner	Cap (ppm cg	e akb):				Screened/C	pen Interval B			(ft BGS)		24 (ft BMP)
Pump and	lubing	Тур	e: M ega M	onsour Pump	with poly tubi	ng		Pump Intake	e Depth:		-	(ft BGS)		23.75	(ft BMP)	MP Descripti		
Equipment	Decon.	Met	thod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	ter Before	Pump	p Installatio	n (ft BMP):	22,90	Time: 6	0638 (9)19 17	W Disposal	I: GW-11 Pond	<u>i</u>
	PURGING	PLING		emp. (°C)		oH Units)	Spec Co	nductivity /cm)	Disso		Oxygen g/L)	The second secon	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	띪	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REAL		CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0635	Х		25.18		6.76		11-1		1,56/0	.31		-98		253		100	23.14	100
0640	X		25.63		6.75		11.0	Ī	1.31/0	26	- 	-145		116		100	23,15	500
0645	V		25.78		6.76		0.9		1.73 6			-148		54.2		100	23.15	1000
0650	X	7	75.92		6.77		10.9		1,10/0,	$\overline{}$		-144		37.8		100	23,15	1700
0655	X		25.98		6.80		10,9		0.98/0			-139		28.7		100	23.15	2000
0700	X		26,04		6.81		10.9		0.87/			-(34		23,5		100	23:15	2500
0705	X	\exists	26.12		6.78		10.9		079/0			-127		19.5		100	23.15	7000
0710	X	\rightarrow	26.17		6.75		10,9		0.76			-121		19.2		100	23.15	3000
0715	X		26.21		6.74		10.8		0.88/0			-119		18.5		100	23.15	4000
0720		X		HOMES	 -\k.'- - -		<u> </u>	<u>-</u>	3-1-	-						\\\		
0 125			PHILIPIE	12311011														
		_				<u> </u>						.0			\	2		
<u> </u>	-{}													<u> </u>	1/2	7		
										_			1	2	92			-
	N																,	
Sample ID:	<u> </u>	201		5-2017	0921	Duplicate ID); - 	<u>]</u>	<u> </u>			QA/QC Sar	nnles/ID: ~				COC Time:	0770
			ntainer	3 2017	0121		6 III = "iii		Materia	al Cod	les: VOA =		•	r Glass: CG	=Clear Glass:	PE=polvethyl	lene; O=Other	
		leria									amination:		Field Filtered		COC Number			3-1
Number	C	ode	Volu	me Pr	eservative	Intended	Analysis and	or Method	Comm		-							
											= NS	i.						
						<u> </u>			Sulfide	= ()	III mg	(L.)		ام . ما				
<u></u>	In	-511	tu Chrom	ium Treatab	oility Study	Sampling B	ottle Set		Ground	dwater	r Color is	Mackin	yellow.	gran	(lig/m)			
									.	ature(s	7	180	/	0	•			
*INDICAT	OR PA	RAI	METERS	HAVE STABI	IZED WHF	N 3 CONSE	CUTIVE RE	ADINGS AR		<u> </u>		77			<u>-</u>			
				Specific (dox Pote	ential:	± 10% for	<u>Dissolve</u>	d Oxvaen	and Turb	idity	
													uto				OA - Ouglitu /	Accurance

LOW FLOW GROUNDWATER SAMPLING LOG

بيب								OUNDY	MILN	SAIVIF	-IIVG LU	,u		N	ERT, Hender	rson, NV Projec
Commence of the Commence of th			reatability Stud		Task Manag	er: Arul Ayy	aswami			Task No: N				Well ID: CT		
Field Sampl	ers: Jeff	Richeson	D. Kend.	7		= = 11				Recorded b	y: Jeff Riches	on, D.K	eade	Date:	1/20/17	_
Well Depth			MP D	stance AGS (ft): —		Well Depth	(ft BMP): 48.9	9		pen Interval T		-7	(ft BGS)		34 (ft BMP
Well Diame				ID Readings 8		Cap (ppm cg	je akb): 👤 🗕	-		Screened/C	pen Interval B	ottom:	_	(ft BGS)	100	49 (ft BMP
Pump and T	ubing Ty	pe: QED Sa	ample Pro (blad	der) with poly	tubing		Pump Intake	e Depth: -	_	(ft BGS)		41	(it BMP)	MP Descripti	ion: TOC	
Equipment (Decon. M	ethod: 3 Bu	cket Rinse witl	n Liquinox			Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	23.13	Time: 6	0639/9/19/	GW Disposa	al: GW-11 Pond	d
	ပ ပို့	To	emp.	p	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
			(*c)		Jnits)	Mus		Harte 294	ng/L)	100.00	(mV)		ITU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*		(ft BMP)	(ml)
1245	X	27.19		7.51		11.4		1.02/0.22		-64		188	1	200	23.35	0
1250	V	2635		747		117		035/0.22		-64 -84		109	+	200	23.37	1000
1255	X	26,03		77.00		11.5		0.12/0.20		-90		-	1			2000
	V			7.47		- Ll					-	67.0	-	200	22.39	-
300	D	25.83	1,50,51	7.46		11.6	-	0.12 (0.20		-92		47.2	-	200	22.40	3000
1305	X	25.84		7.45		11,6		0,04/0.17		-94	-	21.1		200	22.41	4000
1310	X	25.84		7,44		11.6		61,000.0		-93		17.3		700	2241	5000
1315	X	25.83		7,43		11.5		0.000.17		-93		126		200	72.41	6000
1320	X	25.87		7.42	,	11.5	1	0.00/0.17	1	-94	,	7.8	1	200	22.41	7000
1325	X	25.95	1	7:42	1	11.6	1	0.00/0.14	1	-96		47	1(15)	200	22.41	8000
1330	X	STABI	U ZATIO			Ph. 4		1				-				0
1					-								-			
1	1-1-			/						İ			13			
1			/									E 1/29			-	1
			-/									C				R
= 000 N	1										0		-			-
Sample ID:	CTM	MIZAU.	D-201709	120	Duplicate ID					04/000	1-40		1			10-
		ontainer	D-201 70-	120	Duplicate ID	•		Material Co	don VOA	QA/QC San		Class OC	Olean Olean		COC Time:	1330
	Materi						_ 1		ntamination:		Field Filtered		COC Number		lene; O=Other ((Specify)
Number	Code		me Pre	servative	Intended A	Analysis and/	or Method	Comments:		1 11	I tela i literea.	I IX	1000 Nullipe	A.		
								Ferrous Iron								
		L CONTRACT		15-33-2-03					1,18mg 1	L						
	In-S	itu Chromi	um Treatab	ility Study S	Sampling Bo	ottle Set		Groundwate	er Color is	yellow-g	4807					
									2	1	_				1	
					- W-			Signature(s):\	124						
			HAVE STABL						0	()	200 - 100 -	TO THE SECOND	TWO Chip			
± 0.1 for	pH.	± 3% for	Specific C											and Turbi	dity	,
BGS	- Relow (Ground Surfa	ace	C - Centigrad	е	GS - Grou	nd Surface	mg/L - millig	ram/Liter	min - Minu	ite l	MP - Measu	ring Point		QA - Quality A	ssurance

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

10					L	OW FL	OW GR	OUNI	DW.	ATER	SAMPL	LING LC)G		N	ERT, Henders	son,	NV Project
Task Name:	In-Situ C	Chromium Tre	eatability Stud	ly	Task Manag	er: Arul Ayy	aswami				Task No: N	112			Well ID: CTI			
Field Sample	ers: Jeff	Richeson	D. Kead	·							Recorded b	y: Jeff Riches	on, DK	cady	Date: 9-1	9-17		
Well Depth (MP Di	stance AGS (ft):		Well Depth	(ft BMP):	24.5	-	Screened/C	pen Interval T			(ft BGS)		19	(ft BMP)
Well Diamet	er (in): 2	Proble	PID/FI	ID Readings E	Beneath Inner	Cap (ppm co	ge akb): 👤				Screened/C)pen Interval E	ottom:		(ft BGS)		24	(ft BMP)
Pump and T	ubing Ty	e: Mega Mc	PID/FI	with poly tubi	ng		Pump Intake	e Depth:		-	(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC		
Equipment D	econ. M	ethod: 3 Buc	ket Rinse with	n Liquinox			Depth to Wa	ter Before	e Pum	p Installatio	n (ft BMP):	2338	Time: (X636	GW Disposal	I: GW-11 Pond	d	
	PURGING SAMPLING	Te	emp. 'C)		H Units)	Spec Co	nductivity 5/cm)	Disso		Oxygen ng/L)	The second second second	Potential (mV)		bidity ITU)	Purge Rate	Depth to Water		um. Vol. Purged
Time	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA	D'U	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)		(ml)
33	χΙ	30.07		(0.70		16.1		2.16/	0.36		155		856		120	23,50	1	Ø
1318	Ϋ́	29.23		6.67		11.0		1.55/0			158		211		120	73.51	le	00
1323	X	78.85		1 6		11 1	-	0.947			160		52.0		120	23.53		SOP
1328	X	28.73		6.58		11.			0-2)		162	<u> </u>	19.7		170	23.54		800
		28.69		6.55		11.0		0.68			165	 	8.4		120	23.55		460
1333	$ \rangle $				 			0.63/	- 1		165	 	5.1		120	23,55		2000
1338	 	28.71		6.54		11.7		0.56					5.0		120	23,55		<u>}</u> €∞
1343		28.74		6.57				0.25	谱		164		4,9		120			200
1348	X	28.81	AUGV AJASI	19.61		11.1_		וחישרו	0.17				75-1	ļ	120_	23.55	L.	<u> </u>
350	X	STABI	LIZATIO	<i>N</i>					_			-		-	-	ļ		
					ļ				<u></u> -			<u> </u>		 		ļ	-	_/_
<u> </u>		<u> </u>						ļ <u> </u>				60X	-		-	 	-	t/
	<u> </u>			ļ							1.3	COX	9-19-17			<u> </u>		<u>r</u>
													19:17	-	ļ		\angle	
		L											_		ļ			
				<u> </u>											+			
Sample ID:			55-20	170919	Duplicate ID): —	-				QA/QC Sar	<u></u>					119	<u> </u>
S		ontainer			auxii.										s; PE=polyethyl	ene; O=Other	(Spec	cify)
Manuface	Materi		D-	an an intii ia	Intended	Analusia ana	Nor Mathed	_		tamination:	Y N	Field Filtere	3: Y N	COC Numb	er:			
Number	Code	Volur	ne Pi	eservative	Intended	Analysis and	NOT METIOD	Comm	ienis: ie Iron	2W =								
				 	 		<u> </u>	Sulfide	23 IIOII 2 =	0.01 m	mall							
	In-S	itu Chromi	um Treatab	pility Study	I Sampling B	ottle Set		Groun	dwate	r Color is	ant ve	lhw-gr	cen					
	T			,,				1		7	Lit	i. D						
								Signa	ature(s	s): 🗘					5-1			
'INDICATO	R PAR	METERS H	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF			7								
± 0.1 for	:Ha	± 3% for	Specific (ure: ±10								and Turb			
		Ground Surfa Measuring Po		C - Centigra COC - Chair		GS - Gro ID - Ident	und Surface lification	mg/L - mV - n		ram/Liter olts	min - Min ml - millil		MP - Measu NTU - Neph	ıring Point ıelometric Uni	its	QA - Quality (QC - Quality (

LOW FLOW GROUNDWATER SAMPLING LOG

QC - Quality Control

							211 G/1	OONDI		OAMI L	-// TO L.C	Ju		N	EHI, Hender	rson, NV Projec
			reatability Stud	<u> </u>	Task Manag	er: Arul Ayya	iswami			Task No: M	112			Well ID: CT	MW-05D	
			D. Kend	1						Recorded b	y: Jeff Riches	ion		Date: 9 -	19-17	
Well Depth				stance AGS ((ft BMP): 54.0	0	Screened/O	pen Interval T	ор:		(ft BGS)		34 (ft BMP)
Well Diamet	er (in): 2		PID/F	D Readings F	Beneath Inner	Cap (ppm cg	e akb): 🗡			Screened/O	pen Interval B	lottom: —		(ft BGS)		54 (ft BMP)
Pump and T	ubing Ty	pe: GED S	ample Pro (blad	der) with poly	/ tubing		Pump Intake	Depth:		(ft BGS)	-	44	(ft BMP)	MP Descripti	on: TOC	
Equipment (Decon. M	ethod: 3 Bu	icket Rinse with	ı Liquinox			Depth to Wa	ater Before Pur	mp Installation	n (ft BMP): ~	23.56	Time: (2637	GW Disposa	l: GW-11 Pon	d
	<u>0</u> 2	Т	emp.	F	Н	Spec Co	nductivity		d Oxygen	Redox	Potential	Turi	oidity	Purge	Depth to	Cum. Vol.
	PURGING		(°C)	(pHI	Units)	M Was	/cm)	HOD DRU	ng/L)	ORF	(mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1109	X	30:13		7.25		10.4		1.74/0.39		97		13.8		140	23.69	N
1114	X	29.26		7.24		10.4		0.93/0.Z		103		7.2	 .	140	23.70	
1119	Y	28.83		7.25	<u> </u>	10.4				108			 			
1124	 	22.56						0.76 0.19				6.5	<u> </u>	140	73.70	1400
	 			728		10.5		0.63 /0.19		110	 	7.5	ļ	140	23,70	2100
1129	V	28.34		7.29	/-	10.5		0.59/0.21		111	/_	8.1	/	140	23.70	7800
1134_	X	28.24		7.34	V	10.5		0.56/0.12	,	111		8.2		140	23.70	7500
1135	X	STAB	LIZED_					· · · · · · · · · · · · · · · · · · ·					<u> </u>			,
\		<u> </u>														
																1
															/	
				/					/						1	
				/											1	
-										\						
			/							-6	Y					
	1										9-19	17-				
	<u> </u>	1 0==					i					1.F				
Sample ID:	(IM)	1-060	2-201709	19	Duplicate ID			1		QA/QC Sam					COC Time:	1135
Sa	mple Co							Material Co	des: VOA = 4						ene; O=Other ((Specify)
Number	Materia Code	Volu	ma Pro	servative	Intended /	Analysis and/	ar Marthaul	Field Decon	tamination:	Y N	Field Filtered	: Y N	COC Numbe	r:	<u> </u>	
Harriber	Oude	1 Voice	1 110	SOLABILAG	illeliced /	Analysis and/o	or Method	Comments:	- 116						,	
	-	-						Ferrous Iron	= N) 0.02 m	- 11.						
	In-Si	Li Chromi	ium Treatabi	ility Study S	Sampling Bo	ottle Set		Groundwate	r Color is	ا مالت						1
				inj clady c	Jamping De	ottio oct		Circuitate	0010115	diffen à	reen		15			
								Signature(s	DE DE							
INDICATO	R PARA	METERS I	HAVE STABL	IZED WHEN	3 CONSEC	UTIVE REA	DINGS ARF	WITHIN:	·/·	0				• • • • • • • • • • • • • • • • • • • •		
± 0.1 for	:: :Ha	: 3% for	Specific C	onductiv	ity and Te	mperatu	e: ± 10	mv for Re	dox Pote	ntial: +	10% for F	Dissolved	Oxvaen	and Turbi	dity	
BGS -	- Below G	round Surfa	ace	C - Centigrad	е	GS - Grour	nd Surface	mg/L - millig	ram/Liter	min - Minui		MP - Measuri			QA - Quality A	
BMP :	- Below N	leasuring Po	oint	COC - Chain	of Custody	ID - Identifi	cation	mV - milli Vo		ml - millilite			lometric Units		OC - Quality A	

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

LOW FLOW GROUNDWATER SAMPLING LOG

Page Tof 1

NERT, Henderson, NV Project Task Name: In-Situ Chromium Treatability Study Task Manager: Arul Ayyaswami Task No: M12 Well ID: CTMW-06S Field Samplers: Jeff Richeson , D , Kerdy 9/19/1 Recorded by: Jeff Richeson D. Kendy Date: Well Depth (ft BGS): --MP Distance AGS (ft): -Well Depth (ft BMP): 24.4 Screened/Open Interval Top: (ft BGS) 19 (ft BMP) Well Diameter (in): 2 Pump and Tubing Type: Mega Monsood Pump with poly tubing Pump I Screened/Open Interval Bottom: (ft BGS) 24 (ft BMP) Pump Intake Depth: (ft BGS) MP Description: TOC 24 (ft BMP) Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (ft BMP): 23,64 Time: 434 GW Disposal: GW-11 Pond PURGING SAMPLING pΗ **Spec Conductivity** Temp. **Dissolved Oxvaen Redox Potential Turbidity** Purge Depth to Cum. Vol. m (MS/cm) READ CHAN (.C) (pH Units) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* (ml/min) READ CHANGE* CHANGE* (ft BMP) (ml) Time READ CHANGE* READ CHANGE* 198 6.81 79.21 122 1.98/0.61 -114 152 80 23.64 0923 79.32 17.1 J/0347 131 80 -102 23.78 400 0928 6.63 12.0 28/0.33 80 80 800 -98 23.78 0933 6.64 146 12.0 -100 10/0.29 23.78 1200 1.08/0.21 0938 -104 29,76 6.65 124 80 23.78 12.0 600 0143 29.93 6.65 80 -106 127 1.07/0.20 12.0 2,78 2000 6,64 0148 30.22 12.0 -109 124 2400 1.0/0.18 80 Z3.78 STABILI ZATION 0950 DK 9/18/7 Sample ID: GTMW - 065 - 20170917 **Duplicate ID:** COC Time: OPCO QA/QC Samples/ID: Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Ferrous Iron= NS Sulfide = 0,04 In-Situ Chromium Treatability Study Sampling Bottle Set Groundwater Color is Yellow (Gra) Signature(s): 'INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

QA - Quality Assurance QC - Quality Control

LOW FLOW GROUNDWATER SAMPLING LOG

						JWIL	ow an	UVIND	WAIEN	SAMPL		/G		N	EHT, Hender	rson, NV Projec
Task Name:	In-Situ (Chromium T	reatability Stud	ly	Task Manag	er: Arul Ayya	aswami			Task No: N				Well ID: CT	MW-06D	145
Field Sampl	ers: Jeff	Richeson	, Dan.	el E	eady	-				Recorded b	y: Jeff Riches	on D.Ke	ad.	Date: 9	119/17	
Well Depth	(ft BGS):			istance AGS (I	ft):		Well Depth ((ft BMP): 54	.25	Screened/C	pen Interval T	op:		(ft BGS)		34 (ft BMP)
Well Diame	er (in): 2		PID/FI	ID Readings B	Jeneath Inner	Cap (ppm cg	je akb):			Screened/O	pen Interval B	ottom:		₄(ft BGS)		54 (it BMP)
Pump and T	ubing Ty	pe: QED Sa	ample Pro (blad	der) with poly	tubing		Pump Intake	Depth:		(ft BGS)		44	(ft BMP)	MP Descripti	on: TOC	
Equipment (Decon. M	ethod: 3 Bu	icket Rinse with	ı Liquinox			Depth to Wa	ter Before F	ump Installatio	n (ft BMP):	23,95	Time:	9 633	GW Disposa	I: GW-11 Pon	d
<u> </u>	ပ္ ပ္	Т	emp.	р	Н	Spec Co	nductivity	Dissolv	ed Oxygen	Redox	Potential	Tur	oidity (Purge	Depth to	Cum, Vol.
			(°C)		Units)	MUS		TALL WILL	(mg/L)	1.535.24	2 (mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0732	X	25.37	-	6.61		1Z.5		1.03/0.5	7	191		50.1	1	200	24.35	Ø
0737	X	25.35		6.70		12.2		0.24/0.4	7	175		41.3		200	24.37	1000
0742	X	25.30		6.72		12,8		0.14/0.5		171	7 2	38.2		700	24.38	2000
	V	25.33		674		12.8		0.16/0.5		169		31.7		7.00	24.39	3000
0747	\vartage	25,35		6.74		12.7	 	0.15 0.5		, ,		29.4		200		4000
757		25.40	/				-/-			170				1	24.39	1
0757	X	100000000000000000000000000000000000000		6.75	V	12.3	<u> </u>	0.11/0.40	1	170		27.8		200	24.39	5000
0800		STABIL	IZED					ļ		 			ļ	<u> </u>	<u> </u>	ļ
\	 	 		<u> </u>												1
- <u></u>			ļ													<u> </u>
				ļ								l 		<u> </u>		<u> </u>
							ļ			_3	19/17					48.
										160	1/19/					
											14/17	4				
Sample ID:	CTMI	N-06D	- 2017091	9	Duplicate ID	: CTMW-	06D -Z.	170919 -	-FD	QA/QC Sam	ples/ID:				COC Time:)K00
	ample C								Codes: VOA = 4	10 ml glass vi	ial; AG =Ambe	r Glass; CG	-Clear Glass;			
	Materia								ontamination:	(Y) N	Field Filtered	:(Y) N	COC Numbe	r:	and the second	and and all a
Number	Code	Volu	me Pre	eservative	Intended A	Analysis and/	or Method	Commen								
	ļ							Ferrous II								89 TG
		1	ive Teachala	Hite Object 6)E D			Sulfide =	0.10	م بمالمی	16-0-0					
	In-5	tu Chrom	ium Treatabi	ility Study S	ampling Bo	ottle Set		Groundwa	ater Color is	yellow y	તરામ				,	1020
								Signatur	o(s):	21 CK						
*INDICATO	R PARA	METERS	HAVE STABL	IZED WHEN	L3 CONSEC	LITIVE RE	ADINGS ARE		6(2)-	10	<u></u>					
			Specific C						Redox Pote	ential· -	: 10% for l	Dissolver	l Oyvaen	and Turbi	idity +	99
		round Surf		C - Centigrad			nd Surface		ligram/Liter	min - Minu		MP - Measur			QA - Quality A	Assurance
BMP	- Below N	leasuring P		COC - Chain		ID - Identif		mV - milli		mi - millilit			lometric Units		QC - Quality (



WELL WATER LEVEL MEASUREMENT LOG

Page _ of _

Task Name: In-Situ Chromium Treatability Study	Task No: M12	Date: /0/3//7
Task Manager Arul Ayyaswami	Field Sampler(s): Jeff Richeson, D. Kady E-feirce	Recorded by: Jeff Richeson
Equipment Model/Type:	Serial Number:	Last Calibration Date:
Interphase Prober (Bire)		

Well Identification	Describe Measuring Point	Time (hrs)	Depth to Static Water Level (ft BMP)	Well Sounding Depth (ft BMP)	Condition of Well and Well Seal
CTIW-01S	TOC	0649	22.39/228	ro -	Product/Water, good
CTIW-01D	TOC	0649	22.68	-	good
CTIW-02S	тос	0651	22.52	#	aroad
CTIW-02D	тос	0651	22.83	_	Bood
CTIW-03S	тос	0652	22,79	-	9000
CTIW-03D	тос	0652	23.41	-	Good
CTMW-01S	TOC	0645	22,62	-	Good
CTMW-01D	тос	0645	22.74	• \	500d
CTMW-02S	TOC	0643	23.26	- ,	Avol
CTMW-02D	TOC	0643	23.36	-	3000
CTMW-03S	TOC	0642	22.74	-	Bood
CTMW-03D	TOC	0642	22.85	-	Good
CTMW-04S	TOC	0640	23.12	-	500d
CTMW-04D	TOC	0640	23.12	<u> </u>	400d
CTMW-05S	TOC	0639	23.42	_	good
CTMW-05D	TOC	0639	23.54	-	good
CTMW-06S	TOC	0646	23.65	=	9000
CTMW-06D	TOC	0646	23.95		300d
					2
			VIII 232- 1233-		
					·
				6/17	
			0	1 2(.	
			HDK.		
/					
				a familia	

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name: In-Stu Chromium Treatability Study Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task No. MI2 Task Manage: And Aysasvarre Task																	l		
Well Depth (IR BASS): Well Diameter (in): 2 Dirtip Readings Bereath Inter Cap (sproge alb): ScreenedOpen Interval Top: (IR BAS) Dirtip Readings Bereath Interval Cap (sproge alb): ScreenedOpen Interval Soltom: (IR BAS) 24 (IR BMP) Well Diameter (in): 2 Pump and Tubulog Type: MagAlAmeter Below Pump with Poly Tubung Pump interval Depth (IR BASS): Depth to Water Belove Pump Interval Soltom: (IR BASS) 23.5 (IR BMP) Well Description: TOC Solve Read Order (IR BMP) Pump and Tubulog Type: MagAlAmeter Read Pump with Poly Tubung Pump interval Depth (IR BMP): Depth to Water Belove Pump Interval Read Pump In								Task Manage	er: Arul Ayya	ıswami							·		
Well Diameter (n): 2 Prop. PLANAL PUPID Readings Beneath inner Cap (spin ope abb): Screened/Open Interval Sotion: (II BMP) MP Description: TOC Further Titlery Type: Maga-Maneseen Pump with Poly Tubing Further Medical Source from with Liquinos Depth to Martin Belora Pump interval Bottom: (II BMP) MP Description: TOC Further Medical Source from with Liquinos Depth to Martin Belora Pump interval Bottom: (II BMP) MP Description: TOC Further Medical Source from with Liquinos Depth to Martin Belora Pump Interval Bottom: (II BMP) MP Description: TOC Further Medical Source from with Liquinos Depth to Martin Belora Pump Interval Bottom: (II BMP) MP Description: TOC Further Medical Source from with Liquinos Depth to Martin Belora Pump Interval Bottom: (II BMP) Titled William MP Description: TOC Further Medical Source from WINTU) Further Medical Source from Wintuin MP Description: To Martin Belora Pump Interval Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Belora Pump Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Belora Pump Belora Pump Interval Belora Pump Interval Bottom: (II BMP) Pump Belora Pump Belora Pump Belora Pump Interval Pump Interval Pump Interval Pump Interval Pump Interval Pump Interval Pump Interval Pump	Field Sample	rs: Je	II A	icheson 7	CO.Y	w							Recorded by	: Jell Riches	on E.Aeiv	تد	Date: 16 -	3-17	
Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (It BMP): 72.4.7 Time: GW Disposal: GW+1 Pond					,						ft BMP): 23.78	8	Screened/Op	en Interval T	ор:		(ft BGS)	1	19 (ft BMP)
Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (It BMP): 72.4.7 Time: GW Disposal: GW+1 Pond	Well Diamete	r (in):	2	No. Do	يل جاء	PID/FII	D Readings B	eneath Inner	Cap (ppm cg	e akb): -			Screened/Op	en Interval B	ottom:		(ft BGS)	2	24 (ft BMP)
Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (It BMP): 72.4.7 Time: GW Disposal: GW+1 Pond	Pump and Tu	bing '	Гуре	: Mega M	7) ere / <u>1</u> 000300	Pump v	vith Poly Tubi	ng		Pump Intake	Depth:	_	(ft BGS)		23.5	(ft BMP)	MP Description	on: TOC	
Sample Container Number Code Volume Preservalive Intended Analysis and/or Method In-Situ Chromitum Treatability Study Sampling Bottle Set Part											ter Before Pun	np Installation	ı (ft BMP):	72.67	Time:		GW Disposal	: GW-11 Pond	1
Time 2 5 READ CHANGE* READ CHAN			rrs l		0.7			u	Sana Ca	a el continuita e	Discolver	1 Ovugon				idity		Dooth to	Corre Mal
Sample ID: CTIMU - O [5 - Ze 77 to 3] Sample ID: CTIMU - O [5 - Ze 77 to 3] Sample Container Number Code Volume Preservalive Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set Signature (The State of State		2	Ĭ						The second second second		LACTOR STATE		The State of the S						
Sample ID: CTMJ -0 [5 - Ze 770 oz 3 Duplicate ID: Sample Container Number Code Volume Preservalive Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set Signature(m) InSitu Chromium Treatability Study Sampling Bottle Set Signature(m) Signa		120	∯ l		1 -	NGE*					10 (10 (10 (10 (10 (10 (10 (10 (10 (10 (4 1 1 4 1		
Sample ID: CTmW - O 5 - Ze 74 oc 3 Duplicate ID: QA/QC Samples/ID: COC Time: CT3 Sample Container Number Code Volume Preservative Intended Analysis and/or Method Intended Analysis and/or Me					1	ITGL		OHANGE		UIANGE	all a value	OTIMITAL		OTIVITALE		OTTITUE			
Sample ID: CTMJ - 0 [5 - 2e 17 to 0] Duplicate ID: Sample ID: CTMJ - 0 [5 - 2e 17 to 0] Duplicate ID: Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set Signature(s) INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:	9430		K.	_	1						1.09							10	<u> </u>
Sample ID: CTM J - 0 5 - 2e 7 100 3 Duplicate ID: Sample ID: Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set InDicator Parameters Have Stablized When 3 consecutive Readings are within: Signature(m) InDicator Parameters Have Stablized When 3 consecutive Readings are within: Signature(m) InDicator Parameters Have Stablized When 3 consecutive Readings are within:				WAT	R	CoL	JUNY_	100 JH	ORT +	FND 1	RECHAR	JE 700	7504	70 L	W FL	ק לעום	RGED 1	PAMPL	D
Sample ID: CTMU - O [5 - Ze 7 603] Duplicate ID: QA/QC Samples/ID: CCC Time: \$\frac{4}{3}\$ Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Fremous Inon = 0/E=FLOW In-Situ Chromium Treatability Study Sampling Bottle Set Groundwater Color is Light Yelhow Shown Signature Sign				_اربا	PER	STA	CTC P	UMP A	ND TO	C REP	751NG	PROM	HORIL	39_C(1)	ą				
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig	mar of			- 07			·		4										:
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig																			
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig															_/	<u></u>			
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig			\dashv					/	-			<u> </u>					ļ		
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig	<u> </u>		-				····/	<u> </u>					/	<u> </u>				/	
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = OVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature S Signature S Stablized WHEN 3 CONSECUTIVE READINGS ARE WITHIN:	-				ļ				-								/-		
Sample ID: CTMU - O S - Zo 17/003 Duplicate ID: QA/QC Samples/ID: CCC Time: 973 Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set In-Situ Chromium Treatability Study Sampling Bottle Set "INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Sample ID: QA/QC Samples/ID: CCC Time: 973 Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = QVE FLW Sulfide D S Groundwater Color is Light Yellow Swelly Signature Sig					ļ		/_					147					/_	<u></u>	-
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Si							/_					b //					_/		
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Willide O D S Groundwater Color is Light Y willow Swelln		1					/				E.A.		,		\				
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Willide O D S Groundwater Color is Light Y willow Swelln			7				/				8						/		
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Willide O D S Groundwater Color is Light Y willow Swelln				\			/												
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Willide O D S Groundwater Color is Light Y willow Swelln			\dashv											l		-			
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Filtered: Y N COC Number: Signature Filtered: Y N COC Number: Willide O D S Groundwater Color is Light Y willow Swelln			-	-/		-/-													
Sample Container Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Comments: Ferrous Iron = Over Flow Signature Si	Comple ID:	0-	7.	. 1 - ()	10 1	<u>/</u> 2013-	1.57	Duplinata ID		!			OAIOC Sam	nloc/ID:			1	COC Time:	092
Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide OF Groundwater Color is Light Yellow Signature of Signatu					10 - c	ا (7	(803	Duplicate in			Material Co	rdos: VOA /		*	ar Glase: CG	-Clear Glace			1-
Number Code Volume Preservative Intended Analysis and/or Method In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide= 0.05 Groundwater Color is Light Yullow Snewn Signature(s) Signature(s) Signature(s)	- 08	ाशवा	ciia	Illamer														010, 0-01101	(opcon)/
In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide= 6.05 Groundwater Color is Light Yellow Sveen Signature(F) Signature(F) Signature(F)	Number			Volu	ıme	Pre	eservative	Intended /	Analysis and	or Method			, ,,						
In-Situ Chromium Treatability Study Sampling Bottle Set Sulfide= 6.05 Groundwater Color is Light Yellow Snew Signature(5): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:									, , , , , , , , , , , , , , , , , , , ,	·	11		ליימו						
Groundwater Color is Light Yullow Sveen Signature Stablized WHEN 3 CONSECUTIVE READINGS ARE WITHIN:	<u> </u>	ln	-Sit	u Chrom	ium T	reatab	ility Study S	Sampling B	ottle Set		Sulfido-	08							
*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:		<u> </u>		1		1	,,	1 3 -	<u> </u>		Groundwate	er Color is 1	soft Yes	and ann	1 00				
*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:				 								. 0	المار المارة	A. 246	אש				
*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:											Signature	81 X	11/						
	*INDICATO	R PA	RA	METERS	HAVE	STABL	IZED WHEN	3 CONSE	CUTIVE RE	ADINGS AR			0						
20.1 for pit, 20% for opcome contactivity and competatate, 2 forms for field and 1 distribution 2 for the contact and 30 for and 1 distribution												edox Pote	ential; :	± 10% for	Dissolve	d Oxyger	and Turb	idity	

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name:	In-S	Situ C	hromium Tre	eatability Stud	lv	Task Manag	er: Arul Ayya	swami			Task No: M	112			Well ID: CT	MW-01D	
	-	_		pere		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						y: Jeff Riches	E. P.	eira	Date: 10 -	-3-17	
Well Depth					istance AGS (t):		Well Depth (ft BMP): 49.4	1		pen Interval To			(ft BGS)		34 (ft BMP)
Well Diamet					ID Readings B	The second second	Cap (ppm cg	-				pen Interval B		_	(ft BGS)	11125	49 (ft BMP)
	<u>-</u> -	•	e: QED Sar	nple Pro with					Depth: -		(ft BGS)		41.5	(ft BMP)	MP Descripti	on: TOC	
Equipment I	Deco	n. Me	thod: 3 Buc	ket Rinse wit	h Liquinox			Account to the second			n (ft BMP):	22.70	(Time:		GW Disposa	i: GW-11 Pon	d
	SING	SAMPLING		mp. *C)		H Jnits)		nductivity /cm)		d Oxygen mg/L)	The second second second	Potential (mV)		bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	P.U.R.	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0750	1		26.25		7.26		14.1		6.48		-31		13,1		200	22.85	200 Ø
0755	1	+	26.36		7-26		14.1		6.42		-30		12,5		200	22.89	A100 1000
0800	'	-	26.46		7.26		14.0	-	6.40		-29		12.0		290	22.87	1200 7000
0805	1	-	26.71		7.31		13.9		6,43	_	-20		0.0		200	22.87	8/M 7000
08/0	1				7.33		13.8		6.40		-18		6.0		200	22.88	1000 400
	1		26.73		7.34		13.7		6.42	1	-20		0.0	-	200	22.88	1200 500
0815	/	-	26.71		+		13.7			1	-20		0.0		200	22.89	\$40 600
0820	/		26.72		7.34	. /		1./	0.27		-19		0.0		200	72.54	
0825	-	1	26.72	· ·	7.34		13.7		0.28	1 1 .				1.	200	F2.3-6	Karop 7000
	-	-			_				AGC IN	policed in	to Walter	collimie	tron pw	np line.	-		-
		-						1									
\ -	-	-			<u> </u>					\		177			 		
<u> </u>	-	_			ļ	 \ 					-	d3/3		\			
	_	<u> </u>									7						
`	1										-						
		\geq			į												. 00
Sample ID:				D-20	7603	Duplicate ID): -					nples/ID: ~				COC Time:	
5	amp	le C	ontainer							odes: VOA = ntamination:		ial; AG =Ambe Field Filtered				lene; O=Other	(Specify)
Alumbas		Code		me P	reservative	intended	Analysis and	for Method	Comments		G/ N	Field Filtered	: ()> N	COC Numb	er:		
Number	1	Code	Volu	ille ; F	I ESELVACIAE	Mienceu	Allalysis allu	/OI MEIIIOG	4 1	n= 0.06	ma/I						
	- -						<u> </u>			0.09							
		In-S	itu Chromi	um Treatal	oility Study	Sampling B	ottle Set				rellow G	reen					
	\top					<u> </u>				7	AL	-					
	\top								Signature	(s):	25/27						
*INDICATO	OR F	ARA	METERS	HAVE STAB	LIZED WHE	V 3 CONSE	CUTIVE RE	ADINGS AR	E WITHIN:	3	V						
± 0.1 fo	r pŀ	1;	± 3% for	Specific	Conductiv	ity and T	<u>emperatı</u>	ıre; ± 10	my for R	edox Pot	ential;	± 10% for	<u>Dissolve</u>	d Oxyger	n and Turb	oidity	<u>-</u>

LOW FLOW GROUNDWATER SAMPLING LOG

				-	/// / L\	JII GIII	00,10,		<i></i>				146	-111, 110114011	
					er: Arul Ayy	aswami									
s: Jeff	Richeson ,	D. Kendy	E. Perre				<u></u>		Recorded by	y: Jeff Riches	on, D. Ken	dy Eleve	Date: 10/3	17	
BGS):		MP	Distance AGS (ft): —		Well Depth	(ft BMP): 23.7	7	Screened/O	pen Interval T	ор:		(ft BGS)		19 (ft BMP)
r (in): 2		PID/	FID Readings E	Beneath Inner	Cap (ppm co	ge akb):			Screened/O	pen Interval B	ottom: 🕓		(ft BGS)		24 (ft BMP)
bing Ty	pe: Hand B a	ailer Pine	Penstaltil	Pump		1			(ft BGS)			(ft BMP)	MP Description	on: TOC	
						Depth to Wa	iter Before Pur	mp Installation	n (ft BMP): (0643	Time: Z	3,26	GW Disposal	GW-11 Pond	<u> </u>
,, O	T	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turl	oidity	Purge	Depth to	Cum, Vol.
P. Sin									ORP	(mV)	(N	TU)	Rate	Water	Purged
PUR	READ	CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
			7.30	<u> </u>	9.15		652 0.74		-107		45,4				
		Q COLL		SMAIL		RECHAR		1		ew FL		RGED (U MAY		
													/		
	-//-	101/1-1	7	711-92-1	00(0 00	110		/ 12.72	0-2 1 KG	11.100	7 007				-
	-		_	<u> </u>		/									<u> </u>
-						/	-					 			
								ļ		<u> </u>	<u> </u>	<u> </u>			
	ļ				_/_					\		 			
				<u> </u>	/										
\						ļ					D/			<u> </u>	
											16/)
											73/	1			
						<u> </u>					1	*			
		 													
	 							ļ		<u></u>				<i></i>	
(~1M	101-075	S- 70171	003	Dunlicate IF)			l	QA/QC San	nles/ID:	_	1	1	COC Time:	1000
		3 20(7)	002	Dapiroux II			Material Co	odes: VOA = 4		<u> </u>	er Glass: CG	=Clear Glass		_	
Mater	ICI														(
		ume f	Preservative	Intended	Analysis and	I/or Method	Comments			•		•			
							Ferrous Iro	n= 3.23	mall						
							Sulfide =	0.07 mg	-110						
In-S	Situ Chrom	ium Treata	bility Study	Sampling B	ottle Set		Groundwat	ter Color is	Jackich	velloud-	Orren				
										dellon			97		
							Signature		YIY						
pH;	± 3% fo	r Specific	Conductiv	ity and T	emperati	ure; ± 10	mv for R	edox Pote	ential;	± 10% for	Dissolve	d Oxygei	n and Turb	idity	
	S: Jeff BGS): (in): 2 bing Ty econ. M Sing Ty econ. M In-S R PAR	S: Jeff Richeson , 3 BGS): ————————————————————————————————————	S: Jeff Richeson D. Kerdy BGS): — MP (in): 2 PID/ bing Type: Hand Baller P) ne econ. Method: 3 Bucket Rinse w Temp. (*C) READ CHANGE X 76.14 WATER COW A PERUTALIT mple Container waternal Code Volume In-Situ Chromium Treata	BGS): — MP Distance AGS (In): 2 PID/FID Readings Exping Type: Hand Bailer P.) Peristration Recon. Method: 3 Bucket Rinse with Liquinox Temp. (*C) (pH In Property of American Pr	Task Manages: Jeff Richeson, D. Kendy, E. Purce BGS): MP Distance AGS (ft): (in): 2 PID/FID Readings Beneath Inner bing Type: Hand Bailer P. No. Purstalta Pump con. Method: 3 Bucket Rinse with Liquinox Temp. (*C) PH Units) READ CHANGE* READ CHANGE* X 76.14 7-30 WATER COUMN TO SMALL A PERIFFICIAL PUMP AND TO A PERIFFICIAL PUMP AND TO TIME ON TO SMALL A PERIFFICIAL PUMP AND TO TOTAL OLD THE O	Task Manager: Arul Ayy. S: Jeff Richeson D. Kendy E. Purce BGS): — MP Distance AGS (it): (in): 2 PID/FID Readings Beneath Inner Cap (ppm of programmer) Ping Type: Hand Bailer P. De Purstatt Purp BCON. Method: 3 Bucket Rinse with Liquinox Temp. (°C) (pH Units) M (6S) READ CHANGE READ CHANGE READ WATER COWMN TOO SMALL AND A PERUTALTIC Pump AND Trock W. A PERUTALTIC Pump AND Trock W. Today Code Volume Preservative Intended Analysis and Change Code Volume Preservative Intended Analysis and Change Code Volume Preservative Study Sampling Bottle Set	Task Manager: Arul Ayyaswami Situ Chromium Treatability Study S: Jeff Richeson D. Kendy E. Porne BGS): MP Distance AGS (it): Well Depth (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): bing Type: Hand Bailer P. Ne Pen3talth Punp Punp Intake (in): 2 Pump Intake (in): Pump Pen3talth Punp Pump Intake (in): Depth to Well Depth to Well Depth to Well Depth (in): In (in): I	Task Manager: Arul Ayyaswami S. Jeff Richeson D. Kendy E. Purve BGS): MP Distance AGS (it): Well Depth (it BMP): 23.7 In Situ Chromium Treatability Study S. Jeff Richeson D. Kendy E. Purve BGS): MP Distance AGS (it): Well Depth (it BMP): 23.7 In Situ Chromium Treatability Study S. Jeff Richeson D. Kendy E. Purve BGS): MP Distance AGS (it): Well Depth (it BMP): 23.7 In Situ Chromium Treatability Study Sampling Bottle Set Well Depth (it BMP): 23.7 Well Depth (it BMP): 23.7 Purp Intake Depth: Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Water Before Purve Purp Intake Depth to Wa	Task Manager: Arul Ayyaswami St. Jeff Richeson, D. Kerdy, E. Perret BGS): MP Distance AGS (ft): Well Depth (ft BMP): 23.77 PiD/FID Readings Beneath Inner Cap (ppm cge akb): Ding Type: Hand Bailiff Pine Penstath Perrep Con. Melthod: 3 Bucker Rinse with Liquinox Depth to Water Before Pump Installation Premp. (*C) (pH Units) Spec Conductivity M (dS/cm) READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* READ CHAN	Task No. M. Pictance AGS (fit): MP Distance AGS (fit)	In-Situ Chromium Treatability Study S: Jeff Richeson, D. Kendy E. Power BGS :	Task No. M12 St. Jeff Richeson D. Kendy E. Porter MP Distance AGS (ft): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: Screened/Open Interval Top: It BGS:	Stell Richeson D. Kendy E. Füre BGS: MiP Distance AGS (III): Well Depth (II BMP): 23.77 Screened/Open Interval Top: Group of the Comments of the Code Volume Preservative Intended Analysis and/or Method Intended Code in Preservative Intended Analysis and/or Method Intended Code in Preservative Intended Analysis and/or Method Intended Code in Preservative Intended Analysis and/or Method Intended Analysis and/or Method Intended Code in Preservative Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Analysis and/or Method Intended Intended Analysis and/or Method Intended Intended Analysis and/or Method Intended Inte	Mell Discrete Task Nov. M12 Task Manager. Anal Ayyaswami Task Nov. M12 Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Recorded by . delf Richeson, D. Ke. Ay. E. C. Virus Resorted Open Interval Top:	## Task No. M12 Recorded by Juff Richeson Dicentify Study Force

LOW FLOW GROUNDWATER SAMPLING LOG

			_							I				l		
			eatability Stud		Task Manag	er: Arul Ayya	iswami			Task No: M				Well ID: CTI		
Field Sample	ers: Jeff I	Richeson ,	D. Kendy	E. feirc	۷			-		Recorded b	y: Jeff Riches	on D. Kead	Ly, E. Priva	Date: 10	13/17	
Well Depth (t BGS):	-	MP D	stance AGS (ft):		Well Depth (ft BMP): 49.1	8	Screened/O	pen Interval T	op:	<u></u>	(ft BGS)		34 (ft BMP)
Well Diamete	er (in): 2		PID/F	ID Readings B	Beneath Inner	Cap (ppm cg	e akb): 🔝 🗕			Screened/O	pen Interval B	ottom:		(ft BGS)		49 (ft BMP)
Pump and Ti	ubing Typ	e: QED Sa	mpre Pro (blad	der) with poly	tubing		Pump Intake	Depth:		(ft BGS)		41	(ft BMP)	MP Description	on: TOC	
Equipment D	econ. Me	thod: 3 Bud	cket Rinse with	n Liquinox			Depth to Wa	iter Before Pui	mp Installatio	n (ft BMP):	23.34	Time:	0643	GW Disposal	: GW-11 Pond]
	ING LING		emp.		oH Units)	Spec Co	nductivity	Dissolve		Children Co. And Co.	Potential P (mV)		bidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0747	X	26.26		6,50		12.9	1	617/020		295		303		200	23.98	Ø
0752	X	27.39		6.69		13.6		0.19/0.20		185	£	175		200	24.12	(000
0757	X	27.59		6.74		13.7		004/0.19		11[108		200	24.18	2000
0802	X	27.64		6.72		13.7		0.00/0.18		80		61.1		200	24.24	3000
		27.72		6.74		13.7	<u> </u>	0.00/0.17	<u> </u>	57	 	37.6	1	200	24.30	4000
9807	X			6.73	ļ	13.6		0.00 0.15		34	 	39.8		200	24.36	5000
0812	 	27.69					 	0.00 0.15			 		 			6000
0817	 	27.70		6.71		13.6	<u> </u>	 -		-4	 	38.0	 	200	24.38	
0655	<u> X </u> _	27.74		6.70		13.5	ļ	0.00/0.14		· · · · · · · · · · · · · · · · · · ·	-	22,4	 	 	24.39	7000
0827	<u> X </u>	27.76	/	6.69		13.5		0.00/214		-8		21.4	_/_	200	24.39	8000
0832	X _	27.77	V	6.68	V	13.5		0.00 0.13	V	-14	/	20.2	<u> </u>	200	24,39	9000
0840	X	STABU	MITTER							50			ļ			
j																
										/					10/31	
														8	4	
			<u> </u>					 								
Sample ID:	CTM	1-02D	- ZO17100	3	Duplicate ID):		1	•	QA/QC Sar	nples/ID:	_			COC Time: ()840
		ontainer						Material Co	odes: VOA =	40 ml glass v	rial; AG =Ambe	er Glass; CG	=Clear Glass	s; PE=polyethy		
	Pode		200					Field Deco	ntamination:	Y N	Field Filtered	I: Y N	COC Numb	er:		
Number	Code		ıme Pı	eservative	Intended	Analysis and	or Method	Comments								
								Ferrous Iro	u= 0,00) mg/L						
	<u> </u>							Sulfide =	0.00 W	4-12						
	In-S	itu Chrom	ium Treatal	ility Study	Sampling B	ottle Set		Groundwat	er Color is	Yellou-gr	ren			2.5		
										D/(*						
*1410/0470	D DAD	LAETEDO.	LIAVE OTAS	HZED MILE	1000005	חודווים מם	ADIMOC AD	Signature	(S):		, =:				_	
			HAVE STAB						aday Bat	ontial:	4 10% for	Dissolve	nd Ovyger	n and Turb	sidity.	
± U. I TO!	рπ;	± 3% 101	Specific	Conductiv	rity and I	emheran	ne, II	HIV TOT H	EUUX FOL	errual;	± 10 /0 101	PISSUIAG	u Oxygei	ranu rull	nuity	

LOW FLOW GROUNDWATER SAMPLING LOG

					L	JVV I L	JW Gn	JUNDY	AILH		ING LO	u		INE	EMT, Herider	SOII, INV PROJECT
			eatability Study		Task Manag	er: Arul Ayya	ıswami			Task No: M	112			Well ID: CTM	MW-03S	
Field Sample	rs: Jeff	Richeson	E. Perrce	,						Recorded b	y: J <u>eff-Riches</u>	on C. Pen	re	Date: 10	/5/17	
Well Depth (f	t BGS):		MP Dis	stance AGS (it):		Well Depth (ft BMP): 24.3	5		pen Interval To			(ft BGS)		19 (ft BMP)
Well Diamete	er (in): 2	Divid	PID/FI	D Readings E	leneath Inner	Cap (ppm cg	e akb):			Screened/C	pen interval B	ottom: —		(ft BGS)		24 (ft BMP)
Pump and Ti	bing Ty	pe: Mega M	PID/FI	vith poly tubin	9		Pump Intake	Depth: -		(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC	
Equipment D	econ. M	ethod: 3 Bud	ket Rinse with	Liquinox			Depth to Wa	ter Before Pui	mp Installatio	n (ft BMP):	22.74	Time:		GW Disposal	l: GW-11 Pond	1
	PURGING SAMPLING	Те	emp.		H Jnits)		nductivity /cm)	18 18 18 18 18 18 1K	d Oxygen ng/L)		Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1250	N.	24.30		7.23		9.06		2.50		110		0.0		100	NM	0
1255	X	28.48	,	7.24		8.94		2.24		114	-	0.0		100	Nm	700
1300	×	28.51		7.24		8.93		1,79		115		0.0		100	NM	(000
1305	×	2854		7.29		8.86		0.44	-	119		0.0		100	NM	1500
1310	X	29,60		7.30		8.83		0.94	-	119		0,0		100	NM	2000
1315	X	26.66		7.31	/	8.80	1	0.88	/	120	/	9.0	/	180	Nin	3000
1320	V	29.70	\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \	7,32	V	8.79		0,84		120		0.0	V	1.00	NM	Man
13~0		00,00		T: -		9,11		0,04	 	1000				,,,,,	1411	
 				<u> </u>				<u> </u>			 					
					/	\		<u> </u>			\ \			117	 	
 	 -						\	ļ		87.0		 		103		
 				/		<u> </u>	-\					-\		121		
\													3			
<u> </u>					 	<u></u>			<u> </u>	<u> </u>	<u> </u>					1
			31	1	ļ				ļ					ļ	1111	
Sample ID:			75-2017	(00)	Duplicate IC):		1			nples/ID: -					1350
Sa	ample C	ontainer							odes: VOA = -		Field Filtered		=Clear Glass	s; PE=polyethyl	ene; U=Other	(Specify)
Number	Code		me Pre	eservative	Intended	Analysis and	or Method	Comments		1 11	Field Filtered	. 1 14	ICOC Munio	5(.		
Number	1 0000	, , ,	110	7561741175	interiora	rinalysis and	or incurca		n= 50.√ (;	~ ma/1						
						<u> </u>		Sulfide =	ייים אינון אינון	א נשייו ב ג'ל מח						
	In-S	itu Chrom	ium Treatab	ility Study S	Sampling B	ottle Set		Groundwat	er Color is	VOILO :	h Gree	_				
				, ,					7	9000012	n Gree	1				
,								Signature	(s):	H. J.						
1			HAVE STABL							0						
± 0.1 for	pH;	± 3% for	Specific C	Conductiv	ity and T	emperatu	re; ± 10	mv for R	edox Pot	ential;	± 10% for	<u>Dissolve</u>	d Oxygei	n and Turb	idity	

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name:	In-Si	ii C	hromium Tr	reatabilit	v Studi	. <u>.</u>	Task Manag	er: Arul Avva	aswami			Task No: M	12			Well ID: CTI	MW-03D	<u> </u>
Field Sample						4							/: Joff Richoc	en F. Pa	NC0	Date: /ip-	-2-17	
Well Depth (a Peri		stance AGS (t):		Well Depth (ft BMP): 39.4			pen Interval T			(ft BGS)		34 (ft BMP
Well Diamet		-				D Readings E	·	Cap (ppm co	· · · · ·			+	pen Interval B			(ft BGS)		39 (ft BMF
			e: QED Sa			der) with poly			Pump Intake	Depth:		(ft BGS)	<u> </u>	37	(ft BMP)	MP Descripti	on: TOC	
Equipment C	<u>-</u>			<u> </u>			*				mp Installatio	<u> </u>	22.85	Time: /	058	GW Disposa	I: GW-11 Pond	d
	PURGING		Te	emp. (°C)		p	H Jnits)	and the second s	nductivity /cm)	Company of the Compan	d Oxygen mg/L)		Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	E E	SAM	READ	CHA	NGE"	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1/00	K		27,37			8.33		9.26		1.46		55		2,0		200	2386	Ø
1105	X	_	26.40			8.12		9.25		1,23		61	-	0.0		200	23,05	1000
1100	X		26,10			8.00		9.27		1.48		67		0.0		200	23,08	2000
1115	5	_	26,19	-	<u> </u>	7.97		9.25		1.51		71		0.0		200	23.08	3000
						7.97				1.55	 	73		0.0	- 	290	23.04	4000
1120_	X		26.19	1		7.98		9.25		1.58		75		0.0		200	23.09	5000
1125	<u>۲</u>		26.17		_		_/_	9.26			<i></i>	77	V	0.0		200	23.16	6000
1130	X		26.17			7.98		4.26	<u> </u>	1.57	<u> </u>	7.7	-	0.0		000	92.60	- Woo
₍				 									<u> </u>	<u></u>				
	-	_		 			1				/		1	<u> </u>	-			
-		-			/			<u> </u>				\ <u>\</u>	\		1.117		 	\
/_							\	<u> </u>	<u> </u>		ļ	,	\	W	1941			
-	ļ						\							-24			<u> </u>	
			ļ,	/			\			/					ļ		<u> </u>	
<u></u>			/					\								ļ	<u> </u>	<u> </u>
		_				ļ											ļ	l e
Sample ID:	CA	1	112-6	777-	2017	(167_	Duplicate ID): —		. —		QA/QC San	*				COC Time:	
S		e Co rema	ontainer	2.0													/lene; O=Other	(Specify)
N. uka	-	nda		eich:	D.		t-tded	Analysis and	Could athend		ontamination:	Y N	Field Filtered	1: Y N	COC Number	er:		
Number	l C	ode	Volu	ime	Pr	eservative	Intended	Analysis and	/or Method	Comments	s: on=1 9 . <i>5</i>	ws/1						
										Sulfide =	19.00	א עפייו						
	.llr	ı-Si	! itu Chrom	ium Tr	eatab	ility Study S	i Sampling B	ottle Set		Groundwa	ter Color is	Man V.	elima d					
	T					,,						A J	1			8.5		
										Signature	e(s):		/					
									ADINGS AR			V	_					
± 0.1 for	рΗ		± 3% for	r Spec	cific (Conductiv	ity and Te	emperatu	ıre; ± 10	my for R	edox Pot	ential;	± 10% for	Dissolve	ed Oxyger	n and Turk	oidity	

LOW FLOW GROUNDWATER SAMPLING LOG

<u></u>																			
Task Name:							Task Manage	er: Arul Ayy	aswami				Task No: M				Well ID: CTM	AW-04S	
Field Sample Well Depth (ers: Je	ff Ri	cheson , i	D. Ke	zdy. E	Perru	ı						Recorded by	: Jeff Riches	on D. V.ca	dy E. Per	Date:) D	13/17	
Well Depth (t BGS	1: -		М	P Distanc	ce AGS (f	i): —		Well Depth (ft BMP):	24.01		Screened/O	pen Interval T	op:	''	(ft BGS)		9 (ft BMP)
Well Diamete Pump and T	er (in):	2	Phil	ACK INP	ID/FID Re	adings B	eneath Inner	Cap (ppm c	ge akb): —				Screened/O	pen Interval B	ottom:	-	(ft BGS)	2	4 (ft BMP)
Pump and T	ubing T	ype	: Mega Mc	onsoon Pi	ımp with ı	poly tubin	g		Pump Intake	Depth:			(ft BGS)		23.75	(ft BMP)	MP Description	on: TOC	
Equipment D									Depth to Wa	ter Befor	re Purr	np Installation	n (ft BMP):	22.95	Time: (2640	GW Disposal	: GW-11 Pond	
	1: 1	n	To	mp.		р		Spec Co	nductivity	Diese	olved	Oxygen	Redoy I	Potential	Tuel	oidity		Don'th to	Cum. Vol.
	19			*C)		(pH L		m de		Horiba			The state of the s	(mV)		TU)	Purge Rate	Depth to Water	Purged
Time	PURGING	AM.	READ	CHANG	BE* F	READ	CHANGE*	READ	CHANGE*	REA	614	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1327	X		29.83		1	6.82		11.2		1.05/0	.3 Y		-229		35,5		100	23,12	
1332	X	╡.	29.75			e173		11.2		777	0.23		-250	-	39.4		100	23.13	
1337	X		29.76			168		11.2		1-6	0.20		-254		36.2		100	23.15	
1342	X		29.74		1 1	.106		11.2	,		2.19		-248		34.8	,	100	23.16	
1347	X		79.98	V		,64	J	11.2		0.80			-242	V	32.1	V	100	23.17	
1400	 - ,	V	STABIL	17ATH	- 1								1						
1 (00	1		OTTIE	<u> </u>	~ -		-			-					-				
1	+	- -						7	 					1					$\overline{}$
1	-						_/	 }											
	 - -			<u> </u>			/	_		<u> </u>			/				112		
	\ -					_/-			-			/					13/1/		
	\	-				/						_/				The l	OK 1-		
	 -\ -	+			/											XX			
	 	+			-/-						/-								
	-	\forall			/-			$\overline{}$		/									
Sample ID:	CTh	1 10	12045	-2013	-1003	<u> </u>	Duplicate ID	<u> </u>		<u>/</u>		<u> </u>	QA/QC Sam	noles/ID: -		1	ļ	COC Time:	1400
			ntainer		1003	1				Mater	ial Cod	des: VOA = 4		*	er Glass: CG	=Clear Glass		ene; O=Other (
	Men	गावा										tamination:		Field Filtered		COC Number			
Number	Co		Volu	me	Preserv	/ative	Intended	Analysis and	i/or Method	Comn	nents:								
	Ī									Ferro	us Iron	= 2.02	-mall	law-green					
										Sulfid	e = ().00 mg	10'						
	In-	Site	u Chromi	um Trea	atability	Study S	ampling B	ottle Set		Grour	ndwate	er Color is O	ight ye	law-green)				
												11/5	111	V					
						ļ					ature(s	s):	V. /	-					
1									ADINGS AR				Ų.		m.1 .			4 80.	
± 0.1 for	pH;	±	<u>: 3% for</u>	Specif	ic Con	ductiv	ity and Te	emperat	ure; ± 10	mv fc	or Re	edox Pote	ential; :	<u>± 10% for</u>	Dissolve	d Oxyger	and Turb	idity	

LOW FLOW GROUNDWATER SAMPLING LOG

			,			777 7 20	711 GIII	5011	<i>-</i> 111	711611	<u> </u>	-// LC				Erri, Fichaci	5011,	
Task Name:	In-Situ C	hromium Tr	reatability Study	1	Task Manage	r: Arul Ayya	aswarni				Task No: M	112			Well ID: CTI	MW-04D		
Field Sample	rs: Jeff F	Richeson ,	D. Keady	E. Peir	ce						Recorded b	y: Jeff Riches	on Dke	ady Eleito	Date: (0/	3/17		
Well Depth (f	t BGS):		MP Di	stance AGS (ft):		Well Depth (ft BMP)	48.9	9	Screened/C	pen Interval T	op: —		(ft BGS)		34	(ft BMP)
Well Diamete	er (in): 2		PID/FI	D Readings E	Beneath Inner (Cap (ppm cg	je akb):				Screened/C	pen Interval E	lottom: -		(ft BGS)		49	(ft BMP)
Pump and Tu	bing Typ	e: QED Sa	imple Pro (blad	der) with poly	tubing		Pump Intake	Depth:			(ft BGS)		41	(ft BMP)	MP Descripti	on: TOC		
Equipment D	econ. Me	thod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	ter Befo	re Pur	np Installatio	n (ft BMP):	23,12	Time:	0640	GW Disposal	i: GW-11 Pond	d	
	PURGING SAMPLING		emp. (°C)		H Units)	Spec Cor M (u/S	nductivity /cm)	Diss		d Oxygen ng/L)	Laisteni popea p	Potential (mV)	. 7.	bidity ITU)	Purge Rate	Depth to Water	3" "	um. Vol. Purged
Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	RE		CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)		(ml)
1113	X	27.04		7.58		11.5		1.46	0.25		1-78		114		Z00	23.39		
1118	X	26.98		7.41		11.6		0.53			-159	-	97.4		200	23.39		
(123	V	26.90		7.35		11.6		0.27	0,20		-227		67.8		Zoc	23.39	T	
1128	X	74.87		7.33		11.6		0.23			-260		49.6		200	23.39		
1133	Y	76.85	1	7.28		11.6		0.13			-303		28.8		200	23,39		
1138	Ϋ́	24.85		7.28		11.6		0.00			-349		16.1		200	23.39		
1143	Ϋ́	24.83		7.27		11.6		0.00			-397		6.6		Zao	23,39		
1148		PHUSEL	PUPGINE		NGED MOR		JTS 70 /	NFI		ORP.	- -/							
1150	X	RESUM	1	NG-BUING		IORIRA	1										٠,د	
1152	X	26.62		8.05	- SIIIAA	9,99	<u> </u>	1.64/	0.17		-62		0.0		200	22,39		
1157	x	26.23		7.93		10.1		063/			-119		0.0		700	22.39		
1202	X	26.09		7.91		[0.]	ļ	0.53			-128		0.0		200	72.39		
1207	X	26.00		7.89	1	10.1		0.50			-131		0.0		200	72.39		
1215	(K		HZED			<u> </u>												
							- DE 19	13/1	7_						<u> </u>		-	
Sample ID:	CTM	14-04	ID -2017	1003	Duplicate ID	:					QA/QC Sar	nples/ID: -	<u>'</u>	1	<u></u>	COC Time:	121	7
	ample Co			(000)				Mate	rial Co	des: VOA =	40 ml glass v	rial; AG =Amb	er Glass; CG	=Clear Glass	; PE=polyethy	rlene; O=Other	r (Sper	cify)
	Code	1 1 1 1 1 1	· ·		1-1			Field	Decor	ntamination:	Y N	Field Filtered	d: Y N	COC Numb	ег:			
Number	Code	Volu	ıme Pre	servative	Intended /	Analysis and	or Method	Com	ments:	3	-							
										u= 0.00								
	<u> </u>	<u> </u>			<u> </u>			Sulfic		0.00		· .						
	In-Si	tu Chrom	ium Treatab	ility Study S	Sampling Bo	ottle Set		Grou	ndwat	er Color is Y	elloway	reen						
								eia.	naturei	(e). T	314							
*INDICATO	D DADA	METERS	<u> </u>	IZED WHE	I 3 CONSEC	LITIVE BE	ADINGS AR			(8).								
			r Specific (edox Pot	ential;	± 10% for	Dissolve	ed Oxygei	and Turb	oidity		

LOW FLOW GROUNDWATER SAMPLING LOG

$\underline{\underline{}}$																
			eatability Study	!	Task Manag	er: Arul Ayya	aswami			Task No: M				Well ID: CTI	MW-05S	
Field Sample	rs: Je ll	Richeson (-, Peira							Recorded by	/: Jeff Riche s	on, EP	rille	Date: 0	4117-	
Well Depth (f	t BGS):		MP Dis	tance AGS ((t): —		Well Depth (ft BMP): 24.5			pen Interval T			(ft BGS)	' ' /	19 (ft BMP)
Well Diamete	er (in): 2	Pine D	PID/FII	D Readings E	leneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		24 (ft BMP)
Pump and Tu	ıbing Ty	e: Moga M	onsoon Pump v	vith poly tubir	ng		Pump Intake	Depth: -		(ft BGS)		23.75	(ft BMP)	MP Descripti	on: TOC	
Equipment D	econ. M	ethod: 3 Bud	ket Rinse with	Liquinox			Depth to Wa	ter Before Pun	np Installatio	n (ft BMP): 2	23.34	Time:		GW Disposa	l: GW-11 Pond	i
	(5	Te	emp.		Н	Spec Co	nductivity	Dissolved	Ovvoen	Redoy I	Potential	Turl	bidity	Purge	Depth to	Cum. Vol.
	N N		*C)		Jnits)	100	/cm)	DO (n		The same of the sa	(mV)		TU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0755	X	25.20		6.49		10,1		265/1.96		144		0.0		200	23.5%	Ø
0800	X	25.31		b.41	i	10.1		2.09/08		149	-	0.0		200	23.59	(800
0805	X	25.29		6.41		10.1		1.90/0.75		149		0.0		200	23.54	2000
0810	Y	25.31		6.41		10,1		1.98/0.7		148		0.0		200	23.60	3000
0815	X	25.36		6.41		10.1	/	1.82/0.7		148		0.0		200	23.60	9100
0820	X	25.35	/	6.41	/	10.1		1.80/0.18		148		0.0		200	23.61	5000
D825	1	25.37		6.42		10.1		1.78/0.bb		147		0.0	1/	200	23.61	Coco
1	\sqcap	7.0		/			<u> </u>	11/3/002		-1-1-/						
		i	***************************************								<u> </u>					
<u> </u>	-			/								1., []	7-			
			/	<u>/</u>			 			ä	,	10/4/				
						<u>`</u>	\				. 7/6		<u> </u>			
		ļ I	/			<u></u>	\				-9-		,			
-			_/	<u> </u>									-			<u> </u>
<u> </u>		ļ	/										 			
		1 250			1	!				01/000	110				COC Time:	0025
			-2017(0	<u> </u>	Duplicate ID):		I Martada I On	dee VOA	QA/QC San	<u> </u>		Class Class	u DE polyathy		<u> </u>
36	Marcii	ontainer							ntamination:		Field Filtered		COC Numb		/lene; O=Other	(Specify)
Number	Code		me Pre	servative	Intended	Analysis and	or Method	Comments:		1 14	I sola i sitorot		, coo ranio	<i>71.</i>		
								4 1	n= 0.08	malL						
		<u> </u>						Sulfide =	0.01 mg	A/L						
	In-S	itu Chromi	ium Treatab	lity Study 9	Sampling B	ottle Set					Green					
									C.	120	0.007			12		
								Signature((s):	DE Y						
			HAVE STABL							1				, .		
± 0.1 for	pH;	± 3% for	Specific C	Conductiv	ity and T	emperatu	re; ± 10	mv for Re	edox Pot	ential;	± 10% for	Dissolve	d Oxyger	n and Turb	<u>pidity</u>	

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name:	In-Sil	u Chromium 1	reatability Study	,	Task Manan	er: Arul Ayya	iewami			Task No: M	12			Well ID: CT	MW-05D	
Field Sample			and the second		Task Mailey	ei. Alui Ayye	1944(1111	 			: Jeff Riches	on C Pa	σ.	Date: / 0 -		
Well Depth (f				stance AGS (i	t/· ——		Well Denth /	ft BMP): 54.00	<u> </u>	1	pen Interval T			(ft BGS)		34 (ft BMP)
Well Diamete				D Readings B		Can (onm co		11 01411 7: 04.00			pen Interval B			(ft BGS)		54 (ft BMP)
			ample Pro (blad					Depth:		(ft BGS)	port intorvar b	44	(ft BMP)	MP Descripti		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
		**	ucket Rinse with	::_	tabing			ter Before Pun		<u>-ii</u>	7 5 7	Time:	((()()))		I: GW-11 Pond	
Edorbinent				T .					·					Tarr Biopoca	1	
	9	SAMPLING BEAD	emp.		H !='4=\		nductivity	Dissolved			Potential		oidity	Purge	Depth to	Cum. Vol.
	PURGING	¥	(°C)		Jnits)	-	/cm)	DO (n			(mV)		TU)	Rate (ml/min)	Water (ft BMP)	Purged (ml)
Time			CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*			1
0655	X	54.44		6.81		10.0		1.06/1.45		171_		63.9		200	23.68	_Ø
0700	X	84.14	<u> </u>	6.83		10.0		0.98/153		165	Ē	54.4		200	23.68	100-
0705	x	24.07	-	6.54		10.0		0.88 1.46		167		51.6		200	23,70	7000
0710	X	24.02		6.84		10.0		0.80/1.77		166_		46.4		200	23,70	300
0715	X	23 94	1	6.86	<u> </u>	9.96		0.11/1.78		162		43,4		200	23.70	4200
0720	X	23.54		6.88		9.43		1.21/1.83		159		31.6		200	23,76	5000
0725	V	24.40		6.89		9.91		1.26/220		154		26.0		200	23.70	6000
0730	7	24,49	1	6.91		9.90		1.28/235		149		19.2	/	200	23.71	7000
0735		24.50		6.94	/	9.89	/	1.30/2.40		144	1	15.8		200	23,71	8500
	~	X 24.51		6.94	-/-	9.87	/	1.33/245		142		15.0	/_	200	23.71	9000
0740		7 24, 21	- 	0.11		(107		1.22/25		170		12.0		~~0_	<u>می، ۱۱</u>	11.
1		_	 							8.0	. (
\							ļ				10/4	1			ļ	
										- Ob	John T	-		<u> </u>	<u> </u>	
_															<u> </u>	
			1							Ĺ			!			ince /.
Sample ID:		mw - (SD-217	1001	Duplicate ID):				QA/QC San	-					07-40
Sa		Container													lene; O=Other	(Specify)
NI, mala a a	Δ,	Na	ume Pre	eservative	Intended	Analysis and	or Mathod		ntamination:	<u>Y_N</u>	Field Filtered	I: Y N	COC Numbe	er:		
Number	U	ode Vol	uille Fie	SEIVALIVE	intended	Analysis and	OI MELLIOU	Comments:	n= Olla	ma/1						
								Sulfide = 1	0.01 ~	-/L						
	l	-Situ Chron	nium Treatab	ility Study S	ampling B	ellowith	0.000									
		3.12 3.1131		,, -						PINNIE	GIERN			12		
								Signature(s):	X M						
*INDICATO	R PA	RAMETERS	HAVE STABL	IZED WHEN	3 CONSE	CUTIVE REA	ADINGS AR		4							
± 0.1 for	pН;	± 3% fo	r Specific (Conductiv	ity and T	emperatu	re; ± 10	mv for Re	edox Pote	ential;	± 10% for	<u>Dissolve</u>	d Oxyger	and Turt	oidity	

LOW FLOW GROUNDWATER SAMPLING LOG

						L	YV FLC	JVV GITT	DOND	MILIT	OWINI F	IIVG LC	<u> </u>	_	INI	ini, nender	Sun, NV Flojeci
Task Name:	In-S	itu C	hromium Tr	eatability Study		Task Manag	er: Arul Ayya	ıswami			Task No: M	112			Well ID: CT	AW-06S	
Field Sample	ers: J	Jeff F	licheson]	D, Kenly,	E. Pein	e.					Recorded b	y: Jeff Riches	on , b. Ka	b, Elex	Date: 10	4/17	
Well Depth (MP Dis	tance AGS (ft):		Well Depth (ft BMP): 24.4			pen Interval T			(ft BGS)		19 (ft BMP)
Well Diamet	er (in)): 2	D 4	PID/FIC	Readings E	Beneath Inner	Cap (ppm cg	e akb):			Screened/O	pen Interval B	ottom: -		(ft BGS)		24 (ft BMP)
Pump and T	ubing	Тур	e: Moga M	PID/FIE ensoon Pump w	ith poly tubii	ng		Pump Intake	Depth: -		(ft BGS)		24	(ft BMP)	MP Description	on: TOC	
				ket Rinse with					ter Before Pu	mp Installatio	n (ft BMP):	23,65	Time:	0646	GW Disposal	: GW-11 Pond	
The same		(2)	Te	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Tur	bidity	Purge	Depth to	Cum. Vol.
	Si Si	S		(°C)		Units)	M Was		1 1 98 (mg/L)	100000000000000000000000000000000000000	(mV)		TU)	Rate	Water	Purged
Time	PURGING	SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Horin 793	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0828	V		27.87		6.59		11.7				-98		22.4		100	23.76	0
	\					-			311 0,24 2.38 0.21		-95	+:	17.9			23.77	500
0833	÷		27.89		6.58	<u> </u>	11.6				 				100	23.77	
0838	X		28.05		65		11.6		2017019	1	-96		18.3		00		000
0843	X		28.19		6.48		11.6		1.76 0.17		-98		17.3		00	23.77	1700
0848	X		28.33		6.46		11:5	٧	1.47 /0.13		-101	<u> </u>	15.6		_[00	7377	2000
0000		X	STAR	117.A1101	7							ļ <u></u>		ļ	ļ		
				İ									r	3			
													10	17			
	1												1017				
			· · · · · · · · · · · · · · · · · · ·								£3	ne	124				
1	-				/	 				·		A					
	4-	-										K—					
	/	-			· · · · · · · · · · · · · · · · · · ·								<u> </u>		 		
	-			/				 							-		
					- 1.4		lo		1		01/000	1 45				0007:	cam
				5-201719	٥٩	Duplicate ID	1;		l lucio de la		QA/QC San	•	- 01 00	Olass Olass	v DC in almosticul	COC Time:	
5	amp!	ie Ud atoma	ontainer						l	ntamination:		Field Filtered		COC Number	; PE=polyethy	iene; U=Olner	(Specily)
Number		Code	Volu	me Pre	servative	Intended	Analysis and	or Method	Comments		3 14	Triein Lilleren	I. I IN	TOOC MUMB	51.		· · · · · ·
MULLIDE		,0u 0	VOIG	110	301401140	interided.	Allalysis allu	OI INGLIGO	4	n= 2,72	mall						
	-								Sulfide =	0.01 n	201						
	ـــــــــــــــــــــــــــــــــــــ	n-Si	tu Chrom	ium Treatabi	lity Study :	Sampling B	ottle Set		Groundwa	ter Color is	ight (yell	law of fee	4				1
	T					 _	 		11		50 V.J						
	1		_						Signature	(s):	イイン						
'INDICATO	R P	ARA	METERS	HAVE STABL	ZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AR									
± 0.1 for	рН	 ;	± 3% for	Specific C	onductiv	ity and To	emperatu	re; ± 10	mv for H	edox Pot	ential;	± 10% for	Dissolve	ed Oxyger	and Turb	idity	

LOW FLOW GROUNDWATER SAMPLING LOG

$\underline{\underline{}}$	_						777 7 1	m Gire	JOND !	MILII	O/11111 L						3011, 111 1 10,000
Task Name:	In-Si	tu C	hromium Tre	eatability Study		Task Manag	er: Arul Ayya	swami			Task No: M	112			Well ID: CT		
Field Sample	rs: J	eff F	Richeson , 1	D Kendy MP Dis	E-Per	La.					Recorded by	y: Jeff Riches	on , D.Ke	dy Eleve	Date: (1/4/17	
Well Depth (t BGS	3):		MP Dis	tance AGS (f	t): —		Well Depth (ft BMP): 54.	25	Screened/O	pen Interval T	op:	_ <u></u>	(ft BGS)		34 (ft BMP)
Well Diamete	er (in):	: 2		PID/FID) Readings B	eneath inner	Cap (ppm cg	e akb): 🚤			Screened/O	pen Interval B	ottom:		(ft BGS)		54 (ft BMP)
Pump and Ti	bing	Тур	e: QED Sar	mple Pro (blado	ler) with poly	tubing		Pump Intake	Depth: -		(ft BGS)		44	(ft BMP)	MP Descripti		
Equipment C	econ.	. Me	thod: 3 Buc	ket Rinse with	Liquinox			Depth to Wa	ter Before P	ump Installatio	n (ft BMP): [23.95	Time:	0646/1019	W Disposa	: GW-11 Pond	d
	PURGING	SAMPLING		emp. *C)	p (pH l	H Jnits)	Spec Co	nductivity /cm)		ed Oxygen (mg/L)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	E I	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	HAT YOU READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0658	X	0,	26.37		6.45		11.6		1.87/1.17)	200		97.5		200	24.31	Ø
0703	X		27.01		6.57		11.9		124/0.9		181		113		200	24.38	1000
0708			27.16		6.58		11.9		1.57/0.81		178		101		200	24.38	2000
		-	27.29		6.56		11 9		1.24,00		179		99.1		200	24.38	3000
0713	Ÿ	_	• 1		6.56	,	1 9		1.02 0.5		1		95.1		700	24.38	4000
0718		-	27.35	/			11 9	_/	1.00/0.5		179		90.7		200	24.38	5000
0723		7	27:39		6.58		!L[-	1,040.3	<u>'</u>	180	<u> </u>	10.7		200	2 (-30	2000
0730	-	X	STARIL	PEN_								-				<u> </u>	<u> </u>
						/										ļ	<u> </u>
										_			_/_	-		\	<u> </u>
					_/	ļ						14/5		-			ļ
					/						67.	10/1					
	Λ				/							8K/					
							<u> </u>									<u> </u>	
											/						
Sample ID:	CT	mi	N-06D)-20171	004	Duplicate ID	: CTMW	-06D -	2617100	Y-FD	QA/QC San	nples/ID:				COC Time:	0730
			ontainer				1				40 mi glass v	ial; AG =Ambe	r Glass; CG	=Clear Glass	; PE=polyethy	lene; O=Other	(Specify)
1 11 2		nda	1						Field Dec	ontamination:	Y N	Field Filtered	l: Y N	COC Number	er:		
Number		ode		me Pre	servative	Intended	Analysis and	or Method	Commen		1.						
	_								Ferrous I	on=0.2	1 mg/L	-					
	<u></u>				<u> </u>)	-111- 0-4		Sultide =	0.24 n	ngr Li	P/ in					
	ır	1-51	tu Chromi	um Treatabi	lity Study S	sampling B	ottle Set	·	Groundwi	ater Color is	yalow-gr.						
			_						 Signatur	re(s):	XX						
INDICATO	R P	ΔRΔ	METERS I	HAVE STABL	IZED WHEN	L L3 CONSE	CUTIVE RE	ADINGS AR									
				Specific C							ential:	± 10% for	Dissolve	ed Oxyger	and Turk	oidity	

Chemical Reduction Study

WFIW-015

7754 BAN	of Well (B ic Water duct (BTC ter Colur ENT DAT d: mp / Bail bing Ro ged dry?	PUMP BTOC): (BTOC): OC): mm (h): FA	28.31 27.63	BAILER		SURGE BLC ft. ft. ft.	OCK Screen Ler Calculated	ngth: ~ 23	OTHER_		-
Purge Method Materials: Pur Materials: Tub Was well purg Development Time Flow Light 1754 BA1 1812 1812	d: mp / Bail bing Ro ged dry?	les)		SAU				Calculation (a	0.10	4	ft bgs gal
Time Flow cless 2754 B41 2803 1812 1817			_	YES	NO			1. 2. 3. 4	HURIB FULLIAN	+ h-	Sc
1759 1812 1812 1814	w Rate	DTW (ft. BTOC)	Cum. Water Removed	F0.1	340 Temp (*C)	3 % Cond. (mS/pm)	土(U.() ORP (m)V)	DO (mg/y)	Ld 74 Turbidity (NTU)	Other	Comments
1759 1812 1812 1814	rts .		्ह्रवा)	6.31	26.51	2.44	239	1.41	400		
1812 1812 1817 1821				6.98	26.62	2.98	180	1,25	167	_	
812 817 821				7.00	26.63	2.99		1.19	39.8		
४17 ४भ		27.64		7.03	26.61	2-46	145	1,22	34.8		
उ ध				7.08	26.68		205	1.19	36.1		
				7-10	26,83	2.90	201	1.52			
727		12,64	_	7.04	22.05	2.49	201	1.47	34.1		
873				7.12	27.00	3,00	210	1.52	24.9		
843				7.10	27,03	3.00	217	2,00	19.9		
12				7.14	27.18	3.01	225	2,00	20.9		
104				7.14	27.06	3.01	227	30.0	13.5		
09	$\overline{}$		1,2		26.91	3.00	234	2.02	78.0		Should
77 Ba	· (706	28.92	5-95	253	2.08	12.6		~ t
35					28.47		292	122	13,a		1 Dans Cl
340				7.07	27.16	5.82	284	163	19.4		
\$15	ô	17.65	2,2	7.05			299	161	8.0	c'	Maste Sarale 1
SAMPLING D			- 1170	48			<u> </u>		Anal		Method
Method(s):	(4.6	E ASO	" E				VOCs	8260B
Materials: Pum Materials: Tubi	• •			_	20				片	SVOCs Metals	8270 6010B / 7000 Series
DTW at Time o		ing:	•	27.6	Σ					TPH	8015B
Sample ID:	mla IS:	Ī	15/174	017	Edil Ch				ن پکر	EF COL	<u>. </u>
Duplicate Samp	ipie (D:					Field Filter) NO	Ц.		
COMMENTS			<u>i</u> 1210ra	אטודו)	ام ٥٥٠ ٢	1, 2.2	s ms/C	M , U. V	NTW &	.62 mg	r/L
											<u></u>
					_						



. PROJEC	T INFORM/	ATION	8000	Task Numb	er: 02	.51		WELL ID: _	UFIW.	<u>-017</u> .	_207601 Time:	80% 420
	ocation:							Personnel:	Joel	L M	be t.	Hero Z
MELL Di Method: Total De Depth to Depth to	EVELOPME	PUMP (BTOC): er (BTOC): _ TOC): _	38,12 27,54 WA	BAILER		SURGE BLC ft. ft. ft. ft.	Screen Len Calculated	gth: 35 Casing Vol.	OTHER	38.R	Set PR	mp@3557
Purge M Material Material Was wel	DPMENT DA lethod: ls: Pump / Bi ls: Tubing / F Il purgothery ment Criteri	ailer Rope v?		YES ((NO)		-	1. 2. 3. 4	EQUIPMEN	IT MODELS		
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Co	mments
1440	100	27.51	0	7.40	3/13	6.62	230	2.59	4.6			
1445	[00	27.51	200	7.43	31.46	6.64	228	2.98	3.3			
1450	100	27.51	(004	7.48	31,74	6.66	226	3.56	2.6			
1777	(60	27.51	[200	7.5	3/75	6.63	225	3.74	2.3			
1500	100	27.5	2000	7,58	3(.50	6.63	22	3.56	1.1			
1505 8661e	(00) - Co	21.36 Vecte	2500 4 GW	7,58 Sami	32.08 de (Q		218 UF LV	3.93 v-01	1.5	1608	02	
									1			
									-	,		
										N .	33	
Method(Material Material DTW at 1 Sample I	s: Pump/Bi s: Tubing/F Time of Sam	Rope pling: (UFLW-	27.5		3% Field Filter	±la•) NO	Ana	VOCs SVOCs Metals TPH	8 60108 /	ethod 2608 8270 7000 Series 0158
ONTU YU	Hart I	lugar)	(brate) 1942 , 8.0/	Colley Colley	4) 3	1 240 195t	mil to	or bee	TU (40 1H	, 4.49	MS/cm,
ote: 2-inch well	= 0.167 gal/j	ft		4-inch well	= 0.667 gal,		Signature:	70	10 2	he	1	



UFIV-OID

1 2221								10 - 00		23 - 7 100	
	CT INFORM				403	01			WFIU-		
	Number: 1	94-8/6	<u>0</u> 400 8	Task Num	ber: 02			Date:	2-2-20	16	Time: 1000 20 8. Mike G
		1 louds	overna	, NV				Personne	1: <u> </u>	L., 76	10 8., Mike C.
	Location: _	• •	71300	1 14 -				Weather:	Sunty	84-1	00 ° E
2. WELL	DEVELOPM	ENT LOG				_				_	
Method		PUMP		BAILER	_	SURGE BL	оск_ 🝆		OTHER_		
	epth of Well		48.1		_	ft.		ngth: 43	₿ to	WR 12	ft has
	o Static Wat			76		ft.	Calculated	Casing Vol	3,4	+0 - ⊈ ≥-,,,	gal
	o Product (E		-		_	ft.		ŭ			Pari
Length :	of Water Co	lumn (h):	20	37	_	ft.	Purge Vol.	Calculation (one casing vo	i. = 0.041*d	² *h)
3. DEVELO	OPMENT D	ATA				-					
Purge N	1ethod:								EQUIPMEN	MODELS	5 2 .
_	ls: Pump / 8	lailer					-	1.	775	DC/OY -	<u> </u>
	ls: Tubing /						-	2.			
	ll purged dry			YES	No)		-	3.			
				123				4			
Develop	ment Criter	ia:									
			- C								
Time	Flow Rate	DTW	Cum. Water	1	Temp	Cond.	ORP	DO	Tuebidia	0.1	
inne	(gpm)	(ft. BTOC)	Removed	рH	(°C)	(mS/cm)	(mV)	(mg/L)	Turbidity (NTU)	Other	Comments
	mymin		(gal)				(187 -7	(1010)		
1030	120	27.80	0	8,18	29,48	7.74	148.8	8.34	13.2		
(633	120	27.80	360	8.21	28.97	7,76	1455	8.27			
1036	120	784C	120	8.23	28.65	- 4			116		
1039		21.80	ייי שא			7.76	1421	7.40	7.6		
	150	27.80	1080	8.25	28.46	7.75	139.6	7,33	411		
1042	<u> </u>	27.80	1440	8.27	28.39	7,74	138.3	7.13	3,4		
1045	120	27.80	1800	8.78	28.33	7.74	137,4	6-99	3.0		
1048	120	27.80	2160	8.29	28,25		(36.2	6.76	3,4		
Scale	C. 11	octed	0	sample				7 .	T_{T}		-
State	(10.4)	SC FACE	6,00	46600	(A) 114	V UI	20-0	<u> エ</u> レ	1608	02	DTW=27.80
										[
						_ [- 1			
		ľ									
							,				
				-					\longrightarrow		
										[
				4	<u>. </u>						
[1									
							-				
SAMPLIN	IG DATA			0.)	3%	3%	±10 (3/			
Method(s				Low		2/0		%	Analy	/te	Method
•	,. ,Pump / Bai	lor	-	Blade				i	\vdash	VOCs	8260B
	Tubing / Ro		_					i	닏	SVOCs	8270
	me of Sampl		-	-4103	uhung			i	\vdash	Metals	60108 / 7000 Series
Sample ID			17.7.45	(MD-2)	<u> </u>			į	닏	TPH	80158
	Sample ID:	_	A A	111)-2		ield Filtered		i	닏 -	700	-COC
			TOTAL			rieia Filtered	1: (ES)	NO	⊔ _		
COMMEN	NTS	<u> </u>	KED S	tong	COME	5/£	1/65)	1000	* i		
							/	-			
te: 2-inch well = 0	1167 1/6										
ee- e-men wen ± t	10/ gdi/Jt		4	inch well =	0.667 gal/ft		5:2	Has) han	_	
						Si	gnature:	2000	20	(



WF1W-025

	9.55		<u>—(5.83</u>							4 7		
1.		T INFORM					1		WELL ID:	45111-1	25	AC 2 C
l	Project I	Number: 🌋 NÆ	71,0000 8	<u> </u>	Task Numl	ber: <u>02 «</u>	21		Date:	300	<u> </u>	Time: O9 23
l		Location:		ARE	0. 1/6	2 ([]			Personnel:	4-6	-12 /2-	Time: 0925
		,	7	(11) 3	d = XI CF	1741		_	weather:	700 +	3~~~J	51-1-002
	Method Total De Depth to	EVELOPMI : : pth of Well o Static Wate o Product (B of Water Col	PUMP (BTOC): er (BTOC): _	24.20		<u> </u>	SURGE BLC ft. ft. ft. ft.			to to v.13 (ft bgs gal
3.	DEVELO Purge M	OPMENT DA	ATA	R	AIL				1.	HUPLE	T MODELS	
	Materia	ls: Pump / B	ailee					-	2.	JUL 1-	55	
		ls: Tubing / I	` '		<u> </u>				3.	JUL INE	T UL.	Μ
	Was we	ll purged dry		I	YES	NO			4			
	Develop	ment Criteri	a:	-	-							
							-					
Tie	me	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	pH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
317) la	Buil			7.58	27:21	4.12	179	24	28.1		
594		1244			7.11	27.12	4.29	, ,				
		 	120				1	120		30.2		
094			73.20		7.11	27.11	429	188	1,48	10.4		4 10 09
195	ር											PYTCED PY
113	5				l	28.48						
732	7-				706	38.93	595	209		ع دز		
					7.00	100		ررے		,		
141		P 31	h /-		/2 1	FZW	A2.C	- 11				
. 11		LOIL	e ere a	S GLYA	12 W_ L	1-10	-0/-	7_0/6t	805			
_												
									JL			
			·						8-5-4			
									-			
										-		
						\vdash						
		NG DATA		_			0000			Ana	lyte	Method
	Method(-	er.	OSOUE				VOCs	8260B
		s: Pump / 8a							i	닏	SVOCs	8270
		s: Tubing (R	ODEX/		1027	715				님	Metals	6010B / 7000 Series
	Sample II	Time of Sanેય n	mog:	VEZW	407 C	<u>-1,07</u>		_	į		TPH	8015B
		v: 2 Sample ID:	•			?	Field Filter	ed: (ES) NO !	片.	-500	_ co C
			•			·						
5.	COMME	:NTS										
Note: 2-in	nch well =	0.167 gal/f	-		4 inch well	= 0.667 gal/	'ft					7
					65	2-14,	-	Signature:	4			



General\Forms and Templates\Field Forms

WELL DEVELOPMENT LOG DATA SHEET

PLAGE

1.	Project f	T INFORM	ATION 4-8-760	8000	Task Num	ber: <u>(/2</u> -	01		WELL ID:	4F17-	02 I	Time: 10	28	
	Client:	NERI		אין מטול אין					Personnel Weather:	JUMA J	W . 4.	2H2VG	J. LACAD	2
2.	WELL D Method Total De Depth to	EVELOPME	PUMP (BTOC): er (BTOC):	40.84	BAILER		SURGE BLC ft. ft. ft. ft.	Ph-A	ngth: ~~ ₹ Casing Vol.	OTHER	~4 <u>1</u>	ft bgs gal		
3.	Purge M Material Material Was wel	ethod: is: Pump/ B is: Fübing/ I I purged dry ment Criteri	ailer Rope v?	G	W FLI LADDER DIE YES		-	-	1. 2. 3. 4	HULLE	17 MODELS 14 14 - 52 17 - 50 17 - 17			
т	me	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed	±0,10	Temp (°C)	Cond. (mS/cm)	ORP (my)	10 % DO (mg/L)	Turbidity (NTU)	Other	C	omments	
(r d	۹	100	27,26	The second second	7.53	23. 64	7.65	143	01.648	132				
1114			27,30	1500	7.49	33.48	7.49	144	0.54	156				
1119	\		27.70	Zetro	7.52	32:46	7.16	141	0.25	10 3				
1124	(22.30	2500	7.48	33.58	7.21	139	0,21	48.0			-AFT MCH	OTHER
134	7		27.30	3000	7.50	38.64	7.23	119	1.44	10 0		ru	Cen	
135		 	27,32	_	7-82	_	7.04	123	0.71	91.7		00 0	407	
13.5			<u>, </u>	4000	7.54	36.24		126	2.73	81.1		-		
1402			27.30	4500	7.55	35.54	7.11	132	0.50	79.8				
1409	7		27,31	500 O	7.54	35.32		135	0.58	76.3				
143			27.31		7,53	35.29	7.12	138	V.55	73.5		UT ASIL	128	
142	5		27.06										PUMPING	
-								JL		_				
								8-1-16						
4.	Method(Material: Material: DTW at 1 Sample I	s Pump Ba s Tubing R Time of Sam	lope pling:	Inf IW-	27. 02 1 -2	LOW LAPE 32 016 080	SEX	ed: YES) NO	Ana	VOCs SVOCs Metais TPH	60108	Wethod 82608 8270 / 7000 Series 80158	
5. 0.0 (LE0	COMME NTU (UETT		.21 DO	T30.37 3/5		bood , AU FT	3.97 2001	4.02	4.00	pH) 4	5 6	4. 49 m	S/cn)	
Note: 2-ii	nch well =	0.167 gal/f	t		4-inch well	= 0.667 gal,	-	Signature:			74		5	
											-			
vised 7/1: eneral\For		emplates\Fi	eld Forms										Pg of	



Project Client:	Number: 19:	4-27(00	608		oer: <u>02.</u>	νι		Date: 8	UF 1 W-1 3-2011 M. CRE JUNNY	w, H	Time: 0630 2446 J. LARACE	
Method Total D Depth t Depth t Length	DEVELOPME d: epth of Well to Static Wate to Product (B of Water Col	PUMP	a) 144			SURGE BLC ft. ft. ft. ft.	Screen Ler Calculated	ngth: ** <u>**</u> Casing Vol.	OTHER	~ 48 ~ 80J	ft bgs gal ² *h)	
Purge N Materia Materia Was we	Method: als: Pump/Bals: Pubing/I als: Pubing/I ell purged dry pment Criteri	ailer Rope 17	B	LADGE! OPE - D YES			-	1. 2. 3. 4	RED	1 4-52	· · · · · · · · · · · · · · · · · · ·	L
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gai)ML	± 0. t	Temp	Cond.	I IO.O ORP (mV)	10 % DO /(mg/L) /> 0.5 /	Turbidity (NTU)	Other	Comments	
0754	100	27.35 27.35		7.63 7.64	24.24 28.92	7.41 7.42	168	0.49	79.2 55.4			
0804		27,59	15d v	7.65	28.87	7.48	153	0.24	44.8			1
0809		27.57	2000	7-66	28.45	7.42	[51	0.08	43.0			
4130		27.58	2500	7.67	28.85	7.41	147	0.05	33.5			1 /
08 19		27.5}	3 00 0	7.67	28.86	7.41	143	0.01	28.3			
0824		27.58	350U	7.67	28.65	7.41	140	0.00	26. 1			
08 29		27.58	4000	7.68	28.88	7.41	137	0.00	22.1		PANSE- CLEAN FLOW	THEN U
OFOO		27,52	4500	7.40	29.72	7.42	147	0.42	10.2		EBCALIO RAP	
0905		2754	5000	7.55	24.28	7.40	190	0.00	8.6			1
0410		2738	5500	7.60	29.29	7.40	172	0.00	8.2			1
09 65		27.58	egn a	7.60	24.32	7.40	185	0.00	74			1
9420		2756 -	55U U	7.62		7.40	159	0.00	6.9		,	1
d9 25		2794	7000	7.62	29.26	7.41	154	0.00	6.7			1
0130		27.58	7500	7.6L	24.29	7.42	(2)	۵۰،۲۵	6.5		طعم لالاكول	1
1017	4	27.18									APIER SAMPLING	1
Method Materia Materia DTW at Sample	ING DATA I(s). Ils Pump / Ba Ils Tubing / R Time of Sam	ailer lope pling:	WFIN-	BLAD	- OULL		ed: YES) _{NO}	Ana	VOCs SVOCs Metals TPH	Method 82608 8270 60108 / 7000 Series 80158	
5. COMM	ENTS C	colibrated	Hortha LDb, 5/5'C	1637 (C	% 120 ·	autocal	colution	, 4.0	2+H (4.0 Ecu=+1,	0), 4. C. (CT	53 m S/cm (4.4c,) unas, 18,19 (805	
Note: 2-inch well	= 0.167 gal/f	t		4-inch well	= 0.667 gal,	-	Signature:		3	1	5	



												- 6	
1.	PROJEC	TINE	ORM	ATION トイーよりい	8 000	Took March	per: 02.1	1.		WELLID:	W-IL	7.5	Time: 1320
	Client	N E	er:	44-896V	- "	rask Numi	er.	-		Personnel	M LAE	WS.	J. LAC49[
	Project I	Locati	on L	/छा ।	r 41-5	tunn				Weather:	850F	- OVE A	lo MT
2.	WELL D	EVEL	OPME	NT LOG									
	Method		*****	PUMP_X	27.89	BAILER	750		OCK		OTHER	~25	61
					27.35	129.3	3	ft; ft;	Screen Ler	Casing Vol	0.4	<u>-)</u>	ft bgs gal
	Depth to	o Prod	luct (B	TOC):	_				tumr	A 24	1.09 F	1 D6-3	601
	Length o	of Wat	er Col	umn (h):	2.54		2.5	ft.	Purge Vol. (Calculation (a	ne casing vol	= 0.041*d	² *h)
3.	DEVELO			ATA	Le	, F	(2)				EQUIPMEN		
	Purge M Materia		11	ailer		IL Alma	LUW		2	1. 2.		MPSO	
	Materia					LAMPE			-	3.	MILIVI	T wz	M
	Was we					YES	NO			4	YSI-	55	
	Develop	ment	Criteri	ia:									
											8 =		
2015		Flow	, Rate	DTW	Cum. Water	20.1	3 % Temp	3 % Cond.	± IV. U ORP	(U 'A) DO	んり タッ Turbidity	Other	
т	me	- fee	pm) /MIL)	(ft. BTOC)		pH	1.61	(mS/om)	(mys)	(mg/L) >♥.\$	(NTU) >5.00		Comments
1341)	50		27.53	500	7.12	28.26	2.21	110	2,98	0.0		
1350)				1000	7-14	2838	₹.2Z	194	1.24	0.0		100
1400				27,62	1500	7.0	2F.41	8.28	101	1.68	0.0		
1410					2000	7.10	28.55	_	103	1.28	0.0		
1420	- 8			27,62	2500	7.10	28:58	8-22	102	1,22	0.0	75.07E	
1430)			Z7, §3	2000	7.10	28.68	6.24	101	1.25	0.0		STABLE
1450		3		27.60									AFTER TUNPINL
<											- 33		
			_										
					2 10								
21	1 1 1					コレ							
						8-4-4						/	
									703562.77				
4.	SAMPLI Method		ATA				JEE	49 CVP			Ana	-	Method
	Material		np/Ba	ailer			~					VOCs SVOCs	8260B 8270
	Material	ls: Tub	ing/R	lope			Ü.					Metals	60108 / 7000 Series
	DTW at		of Sam		WEIMT	27-61		u .				TPH	80158
	Sample I Ouplicat		ole ID:		W-1007	135-2	DIGNEV	Tield Filter	ed: FE	NO		325	(Or
			- 1961 - 1961		Clos F	hπ	* 47 8 4 5						44 1 Pa 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
SLand	COMM		Ł		CLEO 5	ett inca	LOFM	6/4	CICO.	25	FT 23	M1. C	HALLOW MELL
2-FW	. 001			· ·			70 70	100				77.5	
			Š.										
Note: 2-i	nch well :	= 0.16	7 gal/f	ī		4-inch well	= 0.667 gal,		Signature:		,		1



Client	t Number: 14				per: 02,0	<u> </u>			HIW-O		Time: U93U S. LAGANE	
Projec	t Location;	VEUT	WE AM	S POND				Weather:	820E	DRIZZI	18	
Metho Total I Depth Depth	DEVELOPME od: Depth of Well to Static Wate to Product (B of Water Col	PUMP (BTOC): _4 (BTOC): _4 er (BTOC): _ TOC): _	0.23	BAILER	10	SURGE BLO ft. ft. ft. ft.	Calculated	Casing Vol.	OTHERto ^	BLA	Par	7/4
Purge Mater Mater Was w	OPMENT DA Method ials: (Pump) Ba ials: (ubing) f ell purged dry opment Criteri	ailer Rope v?		LAOPE LAPPE LAPPE	2		-		EQUIPMEN (LOCKIDA SOL INTO	MPSD MPSD	7_	
Time	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed	TO.1	3 % Temp (°C)	Cond. (mS/cm)	I LO D ORP (my)	レジガ DO /tmg/L) プラ・5	パワリング (NTU)	Other	Commen	its
ogets	100	27.06	500	7.53	20.81	7,28	131	0.68	164	10 1 100		
0450		27.06	600	752	28.99	7.27	128	0.36	95.5			
4955		17,47		7.51	27,03		125	0.15	55.9	(- c)		
1100		27.56	2000	7.51	27.04		121	0.03	35.4			0
11 05		27.06	2500	7.51	27.04		(()	D. 00	19.6			
1910	1	20.00	3009	7 50	2701		111	0.12	14.0		.140	
1115	-		3540	751	_	7.23	111	138	16.9		HI 55 1	reren -
1020			4000	7.52		7,21	(10	7.26	9.0			
1025		27.0(4500	7,51	26.71	7.20	107	7,22	9.2		A A D	
[039	+	- V	5000	7.56	26.34	7-21	103	1,16	8.8	_	STOBLE	
(035		27.0]					-				No that the	
					_	_						
											ゴレ	
	+										8-4-16	
	+	-						_				
Metho Materi	LING DATA d(s): als: Pump / Ba als: Tubing / R			3	EE AB	04C			Ana	lyte VOCs SVOCs Metals	Method 82608 8270 6010B / 7000	
DTW a Sample	Time of Sam	pling:	u FIV-0	17.0(3 <u>1</u> -20	ie apra	2/& Field Filter	ed: 🔞	NO		TEE (80158	
	MENTS	-	JEP US	可いべし、			U FT 3	ונו טו				
CALLECATI	P ALI	S _S C	00) . 1	ku Ft	CELEV	D ('7	.23 (w	١ ١ ١ ١	4.0 try	WALLA	ردا	
Note: 2-inch wel	= 0.167 gal/f	t	2/	4-inch well	= 0.667 gal/	-				2		
							Signature:			5	-	
								-	(/		



1.	PROJEC Project N	Numb	er:_L	94-81	Feorce	Task Num	ber: 02	.01		Date: S	4-16		Time: Ū730
	Client: _		NER	lest of		OVER DEAL STREET				Personnel	BUF -	L 2.	LAGADE
T.	Method: Total De Depth to Depth to	pth o Stati	f Well ic Wate luct (B'	PUMP X (BTOC): er (BTOC): TOC): umn (h):	54.4	3/27.		SURGE BLO ft. ft. ft. ft.	Screen Len Calculated	Casing Vol.	OTHER	Fish	ft bgs do nl/ntm
	DEVELO Purge Me Material Material Was well Developi	ethor s: Pur s: Tul l pur	mr/Baine/Figed dry	ailer Rope ?		VW FL ALAPOE LOPE YES	_		-	1. 2. 3. 4	EQUIPMEN HOCK KED SOLIMIT	4 W-3 MASU	52
Tin	ne	tg	v Rate pm) -/M/A	DTW (ft. BTOC)	Cum. Water Removed	ナン. 1 pH	Temp	Cond. (mS/c/h)	CRP (my)	00 (mg/L)	Turbidity (NTU)	Other	Comments
0811	V			29,10	50/V	7.51		7.26	142	2.32	44.0	<u> </u>	
13	S			27,12	וטטט	7.61	26.72		134	2.87	47.8		
0 8 21	_			27,11	1500	7,63	21.80	· .	130	3.00	23.0		
U825				27.25	_	7.66	26.81		124	3.13	12.1		
0830	-				2500	7.68	30.88		122	3.43	7.2		
V835				27.32		7.70	26.90		123	4,41	3.8		
1840				27,29		7.71	26,94		124	4.49	1,8		
J SAR S				27.30	4000	7.71	26.97	7.21	123	4	3 0.6		DT4BLE
V9U4				27.42									WIU PLMT
								8-4-	16				
					_	<u>-</u> .							
! ! ! ! !	SAMPLIA Method(s Materials Materials DTW at Ti Sample IC Duplicate	i): : Pun : Tub ime o	np / Ba ing / Ri of Samp	ope oling:	BOVE	J7.43	00 Fi	V	LIFE 7) NO	Ana	lyte VOCs SVOCs Metals TPH GEE C	Method 8260B 8270 6010B / 7000 Series 8015B
7 - 68 QED	JEn	[N (LAME	S/S ((0)		35 PSI	JID U	. S I ~S/	Em T	4ª O.	INTH, DU
Note: 2-ind	/16		r gai/jt		ı	4-inch weil	= 0.667 gal/	•	Signature:	TUN		26	



Project Client: _ Project 2. WELL C Method Total De Depth to Depth to Length of Hurge M Materia Materia Was we	DEVELOPMIC Static Water Col Development Development Criteri	ENT LOG PUMP (BTOC): er (BTOC): tumn (h): ATA aile	27.95 27.3	BAILER_			Calculated	Personnel: Weather: I Casing Vol.: Calculation (a)	OTHER	23 7 :=0.041*d*	2
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
1045				7.27.	29.64	407	274	0.66	1/2		
1855					7	1,		1,64			BUNCEN ORY
1120					28-16		340	2.18	31.2		
_1132				7.14	27.48	4,22	331	2,20	25./		Purger / Dy
1417	Colle	ected	camp	te u	IW-	94C	2016	205			
					ナレ						
				B	-5-k						
Method(Material: Material: DTW at T Sample II	s: Pump / Ba s: Tubing R ime of Sam D: e Sample ID:	eng)	UFIW:	77,4	B 412	Field Filtere	ed: (YES) NO	Anai	yte VOCs SVOCs Metals TPH	Method 82608 8270 60108 / 7000 Series 80158
lote: 2-inch well =		-		4-inch well :	0.667 gal/j		Signature	7		7	/



WELL DEVELOPMENT LOG DATA SHEET PURG & SAMPLING

Project N Client: _	TINFORM/ Number: 16 NORT ocation: 1	14-876	. ,	Task Numb	er: <u>02</u>	.0 <u> </u>		WELL ID: Date:	UFTU -2-201 Joel L Surmy,	16 16 16 16 184-18	Time: 0720
Method: Total De Depth to Depth to	EVELOPME pth of Well () Static Wate) Product (B' if Water Coli	PUMP (BTOC):= er (BTOC): TOC):	2.30 17.42 NA	BAILER	_ _ _	n. ft. ft.	OCK Screen Len Calculated Purge Vol. C	gth: 333 Casing Vol.:	OTHER	3830	ft bgs set 35.3fthe
ध्यातुर M Material Material Was wel	PMSAT DA ethod PUV s: Pump / Ba s: Tubing / F i purged dry ment Criteri	ge aller Rope		pump by bone YES		me B	d-pump	3 .	aco Mi Colint	U-52 cro Purg 0 200	. Whiter quality meter 10 MP 50 Controller water level meter water quality meter
Time	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed (gal)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
0846	110	26.60	0	8.06	28.31	7.37	133. 9	3.18	3.7		
P849	110	26.60	330	8.09	28.13	7.37	133.5	3.18	3.7		
0851	(10	26.60	660	8.13	27.95	7.35	132.3	3,11	36		
0854	110	26.60	790	8,13	27.9/	7.35	131.9		3.1		
0857	110	26,60	1320	815	27.81	7.34	130.8		2.1		
0900	(10	26.60	1650	811	27,79	7.34		3.00	0.5		
Stable	Colle	eteo (W Sau	wole (10 10 40.	5 W 2 le @ 0	N-04 108 UF	ZW-00	47-20	(0802)	PTW=27.40
SAMPLI	NG DATA			0.(5%	3%	±10	10%	10% Ana	luta	Method
Method(Materials Materials DTW at T Sample II	s): s:_Pump/ Ba s:_Tubing / R 'ime of Sami	ope pling: U j	FIW-04 NA UE	Black Black LPP to 27.42	W Samp et bing 802	Field Filter		NO		VOCs SVOCs Metals TPH	82608 8270 6010B / 7000 Series 8015B
comme Conductivi CEO Setting		ms/c	oribal m (4 5 (164)	(-t2;y) (49)		૦- <i>ca</i> િંધ ૦૦ા હાઈ	arson 3	Solute Db myl	LDB,	10.69	(400), ·
ote: 2-inch well =	0.167 gal/ft	t		4-inch well	= 0.667 gal/		Signature:	Han	21	1	



1. PROJEC	T INFORM	ATION	- on (2)						UFZN		165)
Project & Client:	Number: 19	14-8160	<u>0</u> W8	Task Numb	er: <u>02</u>	.0/_		Personnel:	1-201 Mibe		Time: 0900
_	.ocation:	Hende	ron,	NV					Partly		4, 84-106°F
	EVELOPME		,		_						2-Plawell
Method:	th of Well	PUMP_\	UR, O	BAILER	-	SURGE BLO	OCK Screen Len	4	OTHER_	- 48	ft bgs Get @ 45.2 ft / gal 3PV=103.200
	Static Wat		27.41	-Ht	_	ft.		Casing Vol.	3,	44	rogs Set 19 45.271
	Product (B		/ <u>A</u>		<u> </u>	ft.			1	. 5	SPV=103.20
1.00	f Water Col	lumn (h):	20,5	9		ft.	Purge Vol. C	alculation (o	ne casing vo	= 0.041°d	*h)
	PMENT D	ATA	Ton	П				_	EQUIPMEN		1 ,
Purge M Material	etnoa: s: Purpp / B	ailer	Low	FION?			-	1. 2.	bonde	-	color tubing
ı	s: Tubing / i						-	3.	NEO'N	11 cm Plu	roe MP 50 controlloud
I	purged dry			YES	NO/		•	4	Toline	+ 101	2001 water left
Develop	ment Criteri	ia:							YSI	MPS 5	56
		1	Cum.				$\overline{}$				
Time	Flow Rate (gpm) (mL/nia		Water Removed (gal) M	рH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
0950	100ml/h	T	(8-7)	8,24	7/37	7.48	2090	4,29	0.9		
0953	lao	(8:4)		8.25	30.84	7.56	2000	4.61	8 , t.		
0956	100	4		8.32	29.74	7,60	2000	4.70	7.5		
Change		v qual	ty mo		D 151	and	Horib				07W=27,43
1330		25,7		7.33	2 9.00	7.14/	1364	3,87	3.8		
1333	100			7-34	29.0	7.14	1363	3,69	3,5		
1336	100			7.35	29.01	7,141	135.8	356	3.1		
1334	100			7.35	29.02	7,128	135.3	3.49	2.8		
13 42	140			7.35	29.29	7.10	1347	3.23	3,6		
1345	150			7.33	20.19	7,122		3,55	3.7		
1348	100			7.37	29.42	7.180	133.3	3.77	1.7		
1351	100	7.5/	_	7.38	79.08	7,141	1322	3.61	1,01		
Stable	Col	leet	LIW	Elint	ea)	1400					DTW-27.42
- Office				7							
9					_						
	NG DATA			0.1	3/2	3%	-10	60%	/>GAna		Method
Method(s): s: Pump / Ba	nilor	•	Low F		·			H	VOCs SVOCs	82608
	: Tubing / R			15/2/2	Blue	10P 1	uhing			Metals	8270 60108 / 7000 Series
	ime of Sam		*	27.4			MAN TO			TPH	80158
Sample II	D: • Sample ID:		UFIW-	-D4D	2016080			T		See	@C
						Field Filter	eu: YES	(NO)	, LJ ,		
5. COMME	NTS		K GV	ectth	95:	CbW	6 51	15 (65)	410	DSZ
									· ·		
Note: 7 inch well	D 167 ani //			4 inch	-0663	164			^		
Note: 2 inch well =	U.10/ YUI/]	V		4-inch well	= u.oo/ gal/	_	Signature	Mas	In		

****/16

anlates\Field Forms

Pg ___ of ___



1.	Project N	TINFORMANUMBER: 1	94-87			oer <u>02</u> .	01	Park	Personnel	19-16 J. L	46406	Time: 0 2-15
	Project L	.ocation:	west o	IF 4r-	ל ליטיל ז				Weather	CLOU	by 91	JOF GLIGHT BREE
	Method: Total De Depth to	EVELOPME : pth of Well o Static Wate o Product (B of Water Col	PUMP (BTOC): er (BTOC): _	28.0	0	×	SURGE BLO ft. ft. ft. ft.	Calculated	l Casing Vol.	OTHER 42 to ~	1714	gal
•:	Purge M Material Material Was wel	PMENT DA ethod: ls: Pump / B ls: Tubing / I purged dry ment Criteri	op)		BAIL	Ø NO	-	-	1. 2. 3. 4		1/4 U-	25
	Develop	ment Citteri	d.									
Ti	me	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	EU.1	チラン Temp (*C)	Gond. (mS/cm)	# 10.0 ORP (mV))U⊄ _C DO (mg/L)	Turbidity (NTU)	Other	Comments
US	13	_	25,00		7.73	25,16	4.02	42	1.35	9.2		
UE		-	-	-	7.77	25,70	3.51	37	1.25	33.9		
182	4	-	1	-	7.71	25.68	3.54	41	1.21	17.9		
83	0	-	7		778	2535	3.88	59	1.17	16.9		
184	3	_	-	>1.0	7-80	25.44	3 84	28	1.30	19.9		GREATER THAN
18 51		A Miles	2831									3 Cashe were
250											20	1,77
					/					F-1	7 - 16	
				/								
	1										_	
	SAMPLII Method(NG DATA		e		1 E I	E AR	u VE		Ana	lyte VOCs	Method 82608
	Materials Materials	s: Pump / Ba s: Tubing / R Time of Sam	ope				=				SVOCs Metals	8270 6010B / 7000 Series 8015B
	Sample II Duplicate	D: 2 Sample ID:		AFIW-0	८८ - ८०		Field Filter	ed: YES) NO		JEE (٥٥
	COMME	NTS	2									
ote: 2-ii	nch well =	0.167 gal/f			4-inch well	= 0.667 gal/	-	Signatura		7	8	-3
sed 7/1		emplates\Fi									_	Pg 1 of 1



								- 0			
1. PROJ	t Number: 19	ATION	EL CHINA D		02	Cal		WELL ID:	15-16	CR. I	Time: ひりせく
Proje	ct Number: <u>* 1</u> N <i>E</i> kr	(0)6	0-000	Task Numb	er: <u> </u>			Date:	3. 1.06	APE . M	1, FARMEL
Proje	ct Location:	WENT	OF AT	-S PUNI				Weather:	JUNNY	, WINA	7 9 B F
	DEVELOPME									-	
Meth		PUMP_X		BAILER	_	SURGE BLC	оск		OTHER		
Total	Depth of Well		39.13	7	_	ft.	Screen Len	gth: ~34.	17 to ~	34.12	ft bgs
Depti	n to Static Wate	er (BTOC): _	~ ~ ~	0	_	ft.	Calculated	Casing Vol.	1. 87	<u> </u>	gal
	to Product (B		11.	્ત	_	ft.					
Lengt	h of Water Col	umn (h):	The) 		ft.	Purge Vol. C	alculation (a	ne casing vol	. = 0.041°d°	(*h)
	LOPMENT DA	ATA		LOW F					EQUIPMEN ~		i e
_	Method:	-4		GLADAI			-	1. 2.	ICHN &		.M
	rials:(Pump) / Ba rials: (Tubin) / F			TALE			-	3.	HURB	a U 5	· 1
	well purged dry			YES	NO,)		-	4	WI-		
	opment Criteri			'							
Devel	opinent criteri										
Calif	Flow Rate	DTW	Cum. Water	20.1	<i>3%</i> Temp	3 % Cond.	U ORP	(0 ye	しょうし Turbidity	Other	
Time	(gpm)	(ft. BTOC)	Removed	рH	(,c)	(mS/cm)	(mV)	(mg/L)	(NTU)		Comments
.4 - 8	melon	2 4 6 1	(gat) A4	7	> % 10	45.	198.24			<u> </u>	
(0 03	400	28.11	500	7.72	38.18	3.90	134	1.75	0.0		-
10:08	[60	28.11	1000			3.76		1,98	0.0		3.1
10:13	160	28.11	1500	6.15	39.84		120	4.45	91.5		SATTERY JEAN
1028	100	18-11	2000	8.06	38.41		122	2-25	0.0		RETIACE BATTERY
10:33	100	2821	2500	8.06	31.89	3-79	130	3.35	0.6		
10:40	100	28.21	3000	B.03	30.81	3.80	128	2.83	0.D		
10:45	100	೩ ೪. ೩೩	3500	7.96	30.54	3.82	129	2.40	0.0		<u> </u>
10:52	100		4000	7.92	31.48	3.85	125	2.45	0.0		
10:67	103		4600			3.86	125		0.0		Stabilized
11 15	-	28.12					1.0.7	3 00			Stabilized
		-6	-		<u> </u>						
	 										<u> </u>
	+	m ·					でレ		/	<u> </u>	
				<u> </u>			E-15-16			\rightarrow	
	1	-		<u> </u>			(3-t)	/			
	 										
- (<u> </u>							<u> </u>
	PLING DATA				SED A	MBUVE			Ana	l yte VOCs	Method
	od(s). rials Pump/ Bi	ailer								SVOCs	82608 8270
	rials: Tubing / F									Metals	6010B / 7000 Series
	at Time of Sam	pling:		25,1	4					TPH	80158
Samp	le ID:		151W-6					·		ace (U C
Duplie	cate Sample ID:	:	WFI W-	パエーゼレ	COFIELE	#ield Filter	ed: YES	NO	į U		
. COM	MENTS		QE"	CPMC	5/5	CL(5)					
100			00.000								2-4 X3043543
lote: 2-inch we	ell = 0.167 gal/f	it		4-inch well	= 0.667 gal.	/ft			~ -		
2.0	3-77				(A)	-	Signature:	-	1	1	
								Mr. o.			



	2/ 2		- 24-37			375						
l.	PROJEC	T INFORM	ATION	Carron		0.3	ra -		WELL ID: _	4516 -C	130	Time: <u>0700</u>
	Project N	lumber:	4-87	P 00005	Task Numb	er:	VI		Date:	7 1 1	T A	Time: <u>0700</u>
	Client: _	WERL	111-	NE AR	5 TON	6			Personnel:	950 E	O NA	I PALMEN
	Project L	ocation:	א לא את	75 A1 -	2 100		_		Weather:	72" F	31/4 010	
•	WELL D	EVELOPME	NT LOG	ı		_				. -	_	
	Method:		РИМР 🔀		BAILER	_	SURGE BLO	оск	_ , 11,,	OTHER ~	//	
	Total De	pth of Well ([BTOC]:	49.5	4	_	ft.					ft bgs
							ft.	Calculated	Casing Voi.	3.3	1	gal
	Depth to	Product (B'	TOC):	21,34		_	ft.					
	Length o	f Water Col	umn (h):	214,54		_	ft.	Purge Vol. C	alculation (a	ne casing vol.	= 0.041*d*	*h)
, –	DEVELO	PMENT DA	\TA	. 0 .	ا داست	-W 4 =				EQUIPMEN		
	Purge M			PA	~ P L	7	10W			UED		
		s: Rump/Bi			BLADDE	I.C.				HURY	<u>~ 4-</u>	52
		s: (ubing) F			CALC	-		-	3.	्युग		
	Was well	purged dry	?		YES	NO			4	JULLA	ur w	LM
	Developi	ment Criteri	a:									
				Cum.	20.1	370	34/3	410	1070	1074		
Ti	me	Flow Rate	DTW	Water	pH	Temp	Cond.	ORP	DO	/リプン Turbidity	Other	Comments
		(雪雨)	(ft. BTOC)	Removed		(°C)	(m5/cm)	(mV)	20.5	(NTU) > 1.0		
8:0	0 (100	28.58	5/1/1mL	7.83	30.95	5.14	136	1.46	17.7		
8:0		100		1000 ml		31-14		134	1.42	11.8		
8:10		150		1 5 luni				134	1.22	11.8		<u> </u>
7811		100	28-45		2,82	32.73	010	128	1.10	11.9		
820		(00	28,4J		7.81	32,10		127	1.20	11.8		UTO SILIZED
		(DQ)		2500	1 . 0	3 2 .10	0.10	127	1.20	1411		
10 P			2f.39									GARDINE TEMP
				_								
									1			
		_/					/					
												J.
									1			8-15-h
1	/			-								
$ - \!\!\!\!/$					-		7			-		
<u>(_</u>				_								
		NG DATA				CPE	A D. I E		i	Anai	•	Method
	Method(•				SEE	4200				VOCs	82608
		s: Pump / Ba									SVOCs	8270
		: Tubing / R	•		2 - 4	-					Metals	60108 / 7000 Series
		ime of Samı	-	AEN /-ci	26.4						TPH	8015B
	Sample II	o: Sample ID:		NFIW-U) IZ ~ W []	60813	Field Filter	ed: YES	NO		مدو ت	
	оприсате	: Jampie 10.					rieid riiter	eu. 123	140	. – .		
				1215 10 10	Chm D	7.61	124	1110				
	COMME	NTS		KED:	M11 P	1.50	~. (<u> </u>				
	COMME	NTS		KED.	MU P	1.50	2.	<u>- 1327</u>		,		
	COMME	NTS		QEB.	DITT 6		2.1			,		

1/20



											0.1	
1.	PROJECT	INFORM	ation 14 - 1-760	unde	Took Mary	er: <u>י</u> גע	(a)		Date: 2	4 FW - 0	<u> </u>	Time: 0945
	Project N	NERT	טפי ז רו		lask Numt	er:			Date:	J.L	I C LU P	Time: Otto
	Project L	nestion:	WEST	OF A	A-5 10	ND.			Woother:	54447	(00	· F
				7					weather.	<u> </u>		
2.	Method: Total Dep Depth to Depth to	oth of Well (Static Wate Product (B	PUMPX (BTOC): er (BTOC):_	38.€0 28.20			SURGE BLC ft. ft. ft. ft.	OCK Screen Len Calculated Purge Vol. C	Casing Vol.	OTHER	7 ₫	ft bgs gal *h)
3.	DEVELO	PMENT DA	ΔΤΔ							FOLIPMEN	IT MODELS	
J.	Purge Me		317	1	L0 W	FLOW			1.		+ W-57	
		s: Rump/ Ba	ailer		BLAD	NER		•	2.	QEO !		
		s: Tubing) F			LDTE				3.	SOLLW	T WL	M
	Was well	purged dry	r?		YES (NO)			4	TOI	55	
	Develop	nent Criteri	a:	-								
T	ime	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed	TO, i	3 %, Temp	3 が Cond. (m5/cm)	ORP (my)	(びん) DO (mg/L)	(リプ・ Turbidity (NTU)	Other	Comments
		metim	(,	(gal)~{	ı/	(,c)	(m5/cm)		>0.5	(NTU)		
Ŭ9	401	LUO	28.2	500	7.35	28.51	4.19	128	1,17	4,9		
04	54	(00	28.2	1000	7.30	28.23		125	1.90	4.16		ь
09.		100	28.2	(500	7.39			(2)	191	0.0		
	14	(00)		2000	7.40			120	1,95	0.0		
10				2500	7.36	28.03		122	1,40	0.0		STABILIZE
	_	(O)	28.2	2300	4.26	ربانهم	1017	124	1140	0.0		
103	0		~8.2									AFTER tume
		/			Λ		JL_					
				-	1		f=1(-1x			7		
					1	<u> </u>	2-16-6					- /
					-						Chr 27	
	/									\vdash	-	
/					H							
4.	SAMPLII	NG DATA				0 ==	.=			Ana	lyte	Method
	Method(s	5):				Λ EE	ABUUR				VOCs	82608
		Pump / Ba				_					SVOCs	8270
		dbing									Metals	6010B / 7000 Series
		ime of Sam	pling:	MFIW -	ZF-1						TPH SEE	80158
	Sample II	D: : Sample ID:	•	UI F 6 LO	001-5	oif ar if	Field Filter	ed: (YES)	NO	! 片	-68	(00
					^ -							
5.	COMME	NTS		CLED	CIME	5/5	<u>C165)</u>	60 F	<u>r</u>			
			_									
Mate: 2	in ab wall -	0.167 gal/f	F4	_	4-inch well	- 0.667 pal	//+					



2. 1 1 3. 1	Project N Client: Project L WELL D Method: Total De Depth to Depth to Length o DEVELO Purge M Material Material Was well	EVELOPME pth of Well Static Wate	ENT LOG PUMP (BTOC): er (BTOC): umn (h): TTA ailer Rope	28.1	BAILER			Calculated	Personnel Weather: ngth: 14 Casing Vol.	OTHER 29 to ~ one casing voi EQUIPMEN HURI GEN	44.79 ₹ 0.041°d° NT MODELS BA W	ft bgs gal *h)
Tim	ne	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed	† 0.1 pH	37, Temp	3 YU Cond. (mS/gm)	ORP (my)	1070 DO (mg/L)	Turbidity (NTU)	Other	Comments
080	3	190	27.95	500	7.45	27.36	4,28	155	2.76	0.0		
050		100	77.44	IVUU	7.74		4,21	156	3.70	0.0		
386)	200	27.90	1500	7.75	27:72	4.29	632	3.11	2.0		
0818	g.	100	22.90	2000	7.78		4.29	150	3.65	0.0		
082	3	200	27.42	2500	7.78	27.34	4.28	146	3.69	v. U		STABLE
U 850			28.18									AFIER THM
									İ			77 23 7 7
						_						
												54
												C-16-N
_									- \			/ ~
		,							\			
	/											
	/			1							•	
M M D Si	Aethod(s Aaterials Aaterials TW at Ti ample IC	: Pump / Ba : Tubing / R ime of Samp	ope oling: V	(F. b/ 0	27. q 61-20		490VE	ed: YES	NO	Ana	VOCs SVOCs Metals TPH	Method 82608 8270 6010B / 7000 Series 8015B
	OMME				ET INC.	1/2	Ç 5/.	5 169) 70	FT		
5/41		Crry		ERVEN		duran	eN t	-	^ -		7	
CALLS	MAPU (<u>, 5,</u>	אין טר	4,5	o music	m U	10 NLA	7-1	W mg	12 IC	13.490	DG
Note: 2-inc	h well =	0.167 gal/ft			4 inch well	= 0.667 gal/	•	Signature				



Project Number: 1944				_						. 5111.1	178			
Weather 112	1. PROJECT	T INFORM/	ATION 4-\$-26dc	1008	Tack Street	02.0	1		WELL ID: _	15-16	<u> </u>	Time: 13.25		
Weather 112	Client N	NE21	1 - 7	_ 0	185K NUME	er			Personnel	J. LA	1 . Sua &	M, FARMER		
WELL DEVELOPMENT LOG Method Meth	Project L	ocation:	VEST G	F AP-	S PUND				Weather:	115 %	WIND	y July		
Method: PUMP SaleR SURGE BLOCK Total Depth of Well (BTOC) Si. 6 & R. Socient Ength. Si. 6 & R. Si. 6					-									
Total Depth of Well (BTOC): 51.6 8 ft. Sorean Length: "11.6 k to "51.6 th bys Depth to Product (BTOC)	Method		PUMP X	_	BAILER	_	SURGE BLO	оск		OTHER	_			
Depth to Product (STOC) Depth to Product (STOC) Length of Water Column (h): Depth to Product (STOC) Length of Water Column (h): Development Data Puge Materials (pump) (salier) Materials (pump) (salier) Materials (pump) (salier) Materials (pump) (salier) Materials (pump) (salier) Materials (pump) (salier) Materials (pump) (salier) Time Flow Rate DTW Water DTW Water PH Temp Flow Rate DTW Water PH Temp Cond. DTW Water PH Temp Cond. DTW Water PH Temp Cond. DPH Temp Cond. DPH Temp Cond. DPH Temp Cond. DPH Temp Cond. DPH Temp Temp Cond. DPH Temp Temp Cond. DPH Temp Temp Temp Cond. DPH Temp	Total De	pth of Well (ВТОС):	51.68	3	_		Screen Ler	egth: ح <u>م کالم .</u>	68 to ~	51.62	ft bgs		
Length of Water Column (h)	Depth to	Static Wate	er (BTOC): _	28.38	<u> </u>	_	ft.	Calculated	Casing Vol.	4 .32	461	gal		
DEVELOPMENT DATA Purge Method: Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (Pungl Palier) Materials (26 20		_								
Purge Method: Materials Purge Saller		DEVELOPMENT DATA EQUIPMENT MODELS												
Materials Quoing Railer Materials Quoing Rope Lot E Lot E 3 GULNET VILW A AT E S AT E			ATA	(0	nea Eal	A.3								
Materials Chip Rope Nes Was well purged diry? Nes O VES O O O O O O O O O	Materials: Purpo / Bailer BLAPDER 2 QED MISU													
Was well purged dry? Development Criteria: DTW Cord. TU. JY/J STABLE Comments Time Flow Rate DTW Water PH Temp Cord. ORP DO Turbidity Other (ft. 8TOC) Removed EgaMil-1 (ms/cm) (m	Materials: Tubing / Rope LOTE 3. CULINST WLM													
Development Criteria:														
Time Flow Rate DTW Water Removed PH Temp Cond. ORP DO To Tubblity Other Removed PH Temp Cond. ORP DO To Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond. ORP Do Tubblity Cond.														
Time Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Gro	Developi	ment Cinteri	d.				_		_					
Time Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Flow Rate Grown Gro				-										
Time (gamt) (ft. BTOC) Removed pH (°C) (m5/cm) (mV) (mg/l) (NTU) S.0.		51	D-7141		±0.1	34/9					0.1	_		
Comments	Time				рH						Other	Comments		
1406 100 28.84 1000 7.85 34.64 6.47 17 1.39 22.0 1412 100 28.9 1500 7.85 33.64 6.49 115 1.46 18.1 1418 100 28.91 2000 7.89 33.00 6.72 111 1.52 15.4 1435 100 28.91 3500 7.99 32.63 6.71 112 1.51 13.7 1436 170 28.91 3500 7.99 32.63 6.71 112 1.51 13.7 1436 170 28.91 3500 7.99 32.63 6.71 112 1.51 13.7 1445 100 28.91 4000 7.82 32.70 6.72 113 1.67 9.1 1445 100 28.91 4500 7.85 32.28 6.74 118 1.75 6.3 1450 100 28.91 6500 7.81 32.38 6.71 110 1.85 5.9 1500 100 28.81 6500 7.81 32.38 6.71 110 1.85 5.9 1500 100 28.81 6500 7.81 32.38 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 42.10 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 42.10 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 42.10 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 42.10 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 42.10 6.71 118 1.86 4.8 57.82 Convent 20 to 20.65 1500 28.81 6000 7.87 6000 7.87 6000 7.87 6000 7.87 7.87 1500 1				(gol)ML		,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,						
14 2	A1 1401	100	28.8	500	7.80	37.82	6.64	123	1.45	24.7				
14 8	1406	100_	28.89	1000	7.85	34.64	6.67	117	1.39	22.0				
14 8	1412	10.0	28.9	1500	7.85	33.64	6.69	115	1.46	18 - 1				
1435	1418	* -	28.91	2000	7.89	33.00	672	1/3	1.52	15.4				
1436						32.63	6.71	112	1.51					
136				3/11//					1	11 1				
1446 100 28.91 4000 7.82 37.98 17 1.72 7.4 1450 100 7.82 32.28 1450 1.80 1.				3600						9 1				
1450 100 28.91 4500 7.84 32.28 6.74 118 1.75 6.3 1455 100 28.97 5000 7.84 32.38 6.71 110 1.83 5.0 1600 100 28.84 6600 7.87 62.10 6.71 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75 118 1.86 4.8 57.86 6.0 6.75				2200				_			-			
1455 101 28.87 5000 7.84 32.38 6.71 10 1.83 5.6						***			 			<u> </u>		
500 100 28.84 6600 7.84 32.69 6.73 14 1.87 5.4							6.17			0.0		<u> </u>		
1605 100 28.86 100 7.87 10.10 10.71 118 1.86 4.8 5 TABLE CUMPLIFOUR DECRES							(c-11			5.0				
S S D D D D D D D D		•				-		119		5.4				
SAMPLING DATA	1605	100	28.86	(e080	7.87	62.10	6.71	118	1.86	4.8	STABLE	CONTRIBUT DECREA		
SAMPLING DATA SEP ABUVE Analyte Method	15 15		28.40									OF TURBICITY		
SAMPLING DATA SEP ABUVE Analyte Method						/					175			
SAMPLING DATA												45		
Method(s): SEP 480VE VOCs 8260B Materials: Pump / Bailer SVOCs 8270 Materials: Tubing / Rope Metals 6010B / 7000 Series DTW at Time of Sampling: Duplicate Sample ID: TPH 8015B Duplicate Sample ID: Field Filtered: YES NO COMMENTS UPD 17m6 5/3 (165) 80 FT												E-13-16		
Method(s): SEP 480VE VOCs 8260B Materials: Pump / Bailer SVOCs 8270 Materials: Tubing / Rope Metals 6010B / 7000 Series DTW at Time of Sampling: Duplicate Sample ID: TPH 8015B Duplicate Sample ID: Field Filtered: YES NO COMMENTS UPD 17m6 5/3 (165) 80 FT	4. SAMPLII	NG DATA								Ana	lyte	Method		
Materials: Tubing / Rope DTW at Time of Sampling: Sample ID: Duplicate Sample ID: COMMENTS Commandate C						2ED	3 404 E		<u> </u>		*			
DTW at Time of Sampling: Sample ID: Duplicate Sample ID: COMMENTS Comments Comme	Materials	s: Pump / Ba	iler								SVOCs	8270		
Sample ID:		-	•		- A C.									
Duplicate Sample ID: — Field Filtered: (YES) NO			pling	la et i i · ·		all dale								
Ote: 2-inch well = 0.167 gal/ft 4-inch well = 0.667 gal/ft	•			7710-	V 6 U - 1	V 8 15		ed: YES) _{NO}		<u> </u>	' U		
ote: 2-inch well = 0.167 gal/ft 4-inch well = 0.667 gal/ft				() (5.5	Ê	5/5	_							
	5. COMME	NTS		KUB	Urm 6	3/3	U65	00 د	<u>~ T</u>					
							· · · · · ·			-				
Signature:	lote: 2-inch well =	0.167 gal/f	1		4-inch well	= 0.667 gal/	'ft			7	/			
								Signature:		<u> </u>	-			



'AFINGOES

Project N	T INFORMA Number:	ation <u>94- (7</u>	Encon &	Task Numb	er: 02.0)ı		WELL ID:	4F1W6-17-4	<u> </u>	Time: OLX			
Client: _ Project L	NEA r ocation:	JEST	¢F.	AP - 5	PON	<u>D</u>		Personnel: Weather: _	J. LAI	LECT I	WIND 40°F			
Method: Total De Depth to Depth to	pth of Well of Static Water Product (B'	PUMP	28-17 -			SURGE BLC ft. ft. ft. ft.	OCK Screen Len Calculated Purge Vol. C	Casing Vol.:	OTHER	1.0	ft bgs gal *h}			
Purge M Materia	S PURE B	aller		ADDER	N Fume	ARO			QEA	Mr30				
	s: Tubing / F			LATE	(NO.)		-	3.		Er U	Ln			
Was well purged dry? Development Criteria:														
						- 107		120						
Time	Higher (rt. BTOC) Removed (CC) (mS/cm) (mg/L) (MTU)													
0845	(00)	28.16	500	7.25	28.01	4.52	168	1.07	38.3	<u>.</u>				
0850	(00	28.16	เขขอ	7.34	27.70	4.52	155	1136	17.5					
2855	(00	28.16	1500	7.36	27:56	4.50	146	1.35	4.8		_			
V900	100	28.16	טטטב	7.35	2751	4.50	140	1.39	1.2					
0905	(00	28.16	2500	7:54	27.44	4.49	139	1.29	0.0		STABILIZE			
U125		28-12									ALTER MANY			
	/				\ 		TL-	10						
					\vdash		(() -	Ч			_			
					-\									
														
										٠				
4. SAMPLI Method(NG DATA s):				SEE	Aduve			Ana	lyte VOCs	Method 82608			
	s: Pump / Ba s: Tubing / R									SVOCs Metals	8270 6010B / 7000 Series			
Sample ((ime of Sam D: Sample ID:		uflu-c	28.11 175-201	(0817	Field Filter	ed: YES	NO		3E€ 333	8015B			
5. COMME		3,95 1	QEA J		CPM 'LM, 7	1.5		- 1	7					
Note: 2-inch well =	0.167 gal/f			4-inch well	= 0.667 gal/		Signature:	_		2				



				- 1						715-2	
. PROJEC	T INFORM Number: 1	ATION 94 - 8761	900 B	Tools Street	0/2	D/s		WELL ID: _	UF U-	-041	Time: _C>
Client:	NEE:	1 ()	_	rask ivumo	er: V			Personnel:	丁. 上.	ALAPE	rime:
Project I	Location:	WEU;	OF A	1-5	או מי			Weather:	Tend	יישו, ל	LIPA GOVE
. WELL D	EVELOPME	NT LOG	,								-
Method		PUMP_	to the second	BAILER		SURGE BLO	оск	2/25	OTHER =		
Total De	pth of Well	(BTOC):	41.14		_	ft.	Screen Len	igth:	19 to -	41.14	ft bgs
•	Static Wat				_	ft.	Calculated	Casing Vol.	2 ,14		gal
	Product (B				_	ft.					
Length o	of Water Col	umn (h):	۷. و ا	9	_	ft.	Purge Vol. (Calculation (o	ne casing val	. = 0.041*d ²	*h)
DEVELO	PMENT D	ATA			**				EQUIPMEN		
Purge M				LOW.	PER	1		1.	HORID	1 U-	57
	Is:(Pur n) (/B			BLA.	ASGA		-	2.	GEO ,		
Materia	ls: Vubing/ I	Rope		LOI	Fal		_	3.	PALIA		
Was wel	ll purged dry	/?		YES	NO)			4	BLAS	DEA P	4M1 tro
Develop	ment Criteri	ia:									
		_									
	Flow Rate	DTW	Cum. Water	TOLL	3 ∀∂ Temp_	3 7 d Cond. /	ORP C	107a	Turbidity	Other	
Time	(gpm)	(ft. BTOC)	Removed	pH	('cy	(mS/cm)	(mV)	(mg/L) >0.5	(NTU)		Comments
0710	100	27,95	500	7-40	25.11	4.45	(3.5	(,05	18.7		
0715	100	27.83		7.50	26.54	446	132	1.65	8.1		
		_	1511	7.02		4.47			3.4		
0720	100	27.35	1500	7.66	25:80		103	1.47	1,3		
V725			2000				98		_		
0710	00	27.85	2300	7.73	26.84		101	1.85	0.0		
2735	100	27.85	3000	7,73	26.84		104	1,47	0.0		
U740	100	2783	3500	7.75	26.82	4,49	103	2.02	0.U		STABILIZES
シをつり	_	28.10								_	AFTER FLIMT
							JL			_	
					$\overline{}$	_		11			
							8-17-	13,			\
		[
										_	
							/				
-/-										•	
-/	 	 									
CARADI	NG DATA								A	luka	88-46-4
SAMPLI Methodi					ES	ABO	fut .		Апа	vocs	Method 82608
`	ısı. s: Pump / Bi	ailer			<u> </u>				! 🗂	SVOCs	82008 8270
	s: Fullip / Bi s: Tubing / F									Metals	6010B / 7000 Series
	Time of Sam			27,	<u>ት</u> ፍ				!	TPH	8015B
Sample I		h-u.P.	MFIW:		- 20160	817) !	<u> </u>		CUL
	ບ: e Sample ID:	:	- 7 1 04 7	U+ y	2000	Field Filter	ed: (VES	NO			<u> </u>
			(dra	ALC 4TH	· [] C				V.c.1 Pi-		
COMME	EN15	,	WED	METHA	<u>ال الما ال</u>	1M3 (<u> </u>	77.7	XU FT		
An Thunk H	0.167 - 10			e t- al.	-0.007	(50					
te: 2-inch well =	= v. 16/ gal/j	1		4 INCH WEII	= 0.667 gal/		Signature				
							-Briditing.			A -	



1. P	ROJECT	INFORM	ation 14-87	ט ע ע ענ)		CA	e/ 1		WELL ID:	4F1 W-	<u>≈</u> 30	i7o £
Pi	roject Nu lient:^	Imber: <u> </u>	4 (Task Numb	er:				7 64	-C MAD	Time: _13 2 5
Pi	roject Lo	cation:	WELL	UF A	1-5 00	NO			Weather:	WINDY	BUNY	ILITOF
2. W	VELL DEV	VELOPME	NT LOG									
i	lethod:		PUMP		BAILER	_	SURGE BLO	оск	.146	OTHER	TF - 6	
		h of Well (51,24		_	ft.					ft bgs
			er (BTOC): _	28/2	3.5		ft.	Calculated	Casing Vol.	3.82	<u> </u>	gal
	•		TOC):	22.0	<u> </u>	_	ft.	Duran Hali C	alaulasiaa (a		- 0.041443	
<u> </u>			umn (h):				ft.	Purge Voi. L	aiculation (a	ne casing vol		<u> </u>
	E VELOP urge Met	MENT DA	ATA		LOW F	-00			1.	EQUIPMEN HUNG	it models ト いーし	
	_	Pump B	ailer					-	2.	WED C		<u> </u>
		TOUR / F			STADE	0		-	3.		T. WILL	4
		ourged dry			YES	(0)		•	4	W1-	17	
Di	evelopm	ent Criteri	a:	_								
_												
				Cum.	2011	370	3%	210.0	1070	180		
Time	E F	Flow Rate	DTW	Water	pH	Temp	Cond.	0RP		Turbidity	Other	Comments
		(Bpm)	(ft. BTOC)	Removed tgail-L		(LE)	(mS/c/h)	(my)	(mg/L) >∪-Ç√	(NTU) フS. ひ		
1408		100	25.84	500	7.54	37,64	5,14	137	2.53	27.5		
1415		(00	25.84	1200	7-60		5.23	140	3.54	28.1		
1420	$\overline{}$	100	25,24		7,61	37; 5Z		139	3,76	20.5		
1425		(00)	25-84		7.71	16.60		137	3.85	15,1		
1430		100	25.84		7.71	35.41	5.2	138	4.02	8.8		
1435		100	25.84		7.70	35,09		139	3.43	7.6		
1440		100	25.84	-		35.21		139	4.01	7.7		
1445	- 1	100	25.84	4206	7.70	35.06	5.24	134	4.03	7.5		STAPINE
(300			24,33									ARTER FURT
							_	JL.				
								-16-6				
						\					/	
ζ												
4. 5/	AMPLIN	G DATA			. —					Ana	lyte	Method
М	lethod(s)	4				(EE.	3408				VOCs	82608
М	laterials:	Pump / Ba	iler								SVOCs	8270
		Tubing / R	•		7.6	-					Metals	6010B / 7000 Series
		ne of Sam		. E	25,8						TPH C	80158
	imple ID: uplicate 5	: Sample ID:		<u> </u>	170-20	-008 NO	Field Filter	ed: YES) NO	! 	ree c	NC .
				254 1	Stine?	CIM			/			<u> </u>
5. CC	OMMEN	113		REA J	EN 11 [84]	, <u>UIM</u>	<u> </u>	15 T	165)			
Note: 2-inch	n well = 0	1.167 gal/fi			4-inch well	= 0.667 gal/	-	Signatuçe				
								n'Enernîs.			-	



0.00				100		100					
	TINFORM							WELL ID:	UFIW-	087	
	Number: 19		Do R	Task Numb	oer: <u>02.0</u>			Date: 08	119/16	m ER	Time: <u>0700</u>
Client: _	NERT	NEWT-	Nende	esan	NIC mai	ch.D.A.	-sand	Personnel:	clove	Iu . a	0 * F
			TIGIT OF	43017	too' me:	a de	-sporm	weather:	GIUUV		
	EVELOPME										allV
Method	th of Well	PUMP	7.561	BAILER _X	_	SURGE BLC	CK	igth:	OTHER	— _p &	(a)
Total De	pth of Well	(BTOC):4	4.22		-	ft.	Screen Ler	igth:	to	2011	ft bgs
	Static Wate				_	ft.	Calculated	Casing Vol.	24-8		gal
Length (o Product (B of Water Col	uma (b):	1531		_	ft. ft.	Purne Vol. (alculation (a	ne casing vol.	-0042*d2	· shi
							7 bige voi. t				
	PMENT DA	ATA	انده	}					EQUIPMEN		
Purge M		-33	_Bail			-		1.	HOKID	4 0-6	200
	ls: Pump / 🛭 ls: Tubing / (Twi	ne			•	2. 3.	30110	5" W.	.,,,,,
I	l purged dry			YES	NO		•	J. ⊿	491	19 .	
				163	110			**			
Develop	ment Criteri	ia:									
			Cum.								
Time	Flow Rate	DTW	Water	pH	Temp	Cond.	ORP	DO	Turbidity	Other	Comments
	(gpm)	(ft. BTOC)	Removed	""	(°C)	(mS/cm)	(mV)	(mg/L)	(NTU)		Comments
0700			(gal) - 1/8 7_	1 23	2016	6.2	14.2		7 5 1		
0722	7,		7000	6.33				1.15			
0734	_		#4 ge	7.38	2625	5.21	162	1.6	73		
0741			3/8-6	7.42	26.00	5.22	161	1-11	70.3		
0750	20		_ •	7.45	25.72			1.29	70.3		Yax casing
0759	-				25.78			1.15	86.0		Valume
		76 .	51	1.10	45.10	- 4 0	174	1.13	46.0		valum &
0805		28.0	71								Reached
	1									4	
							1				
4. SAMPLI	NG DATA										
4. SAMPLI Methodi	NG DATA			566	about	<u> </u>			Anai	•	Method
'	,s). s: Pump / Ba	siler	•	JEC	0000			-		VOCs SVOCs	82608 8270
	s: Tubing / R		•							Metals	6010B / 7000 Series
	Time of Sam		•							TPH	8015B
Sample I			FIW						X		COC
,	e Sample ID:					Field Filter	ed: YES	NO			
5. COMMI	NTC -	204.5-	0-11:-	admin .	-11 -	- 0 · 1	20.0	11 11 0	·	- 100	
cond =	160	0655-	Turk	: Nome	lemp	30.3	20 C 1 P	H = 4.0	2 ORP	- 200	<u>m * /</u>
Lung =	1J v m	Hair	WK 101	MIN = 1	טיט נטן	U, DI	= 7.41	mg / L	- 100 T	= 100.	<u>~ (· </u>
				_			_				
Note: 2-inch well =	0.167 gal/f	i		4-inch well	= 0.667 gal/	/ft	-	100	1.	1)	
							Signature	[I unar	dai +	non	<u> </u>



				_					7	0 =			
1. PRO	DJECT INFORMA ect Number:	ATION	Chican		מז נ	3		WELL ID:	JFIW-U	<u>P</u> I	_ (370		
	ect Number: nt:V_E&<	1-(- 0 N	-0000 B	Task Numb	er: 2 - U	<u> </u>		Date:	J. 11	IG LAF	Time:() 10		
Elie	ect Location:	JECT	OF AN	S PUNE	<u>, </u>			Weather:	(66/20	1. 4/11	ing west		
			<u> </u>					weather.		2-1-7-			
	LL DEVELOPME	PUMP	,	044.50					OTHER				
	hod: al Depth of Well		39,2	BAILER		ft.	Scroon Lon	mh~24.	OTHER	74,29	ft has		
Den	th to Static Wat	er (RTOC):	27.9	₹*	_	ft.			1.43		gal		
Dep	th to Product (B	TOC):	-			ft.	obicalatea				85.		
Len	th to Product (B gth of Water Col	umn (h):	11.87		_	ft.	Purge Vol. C	alculation (a	ne casing vol	$= 0.041 * d^2$	*h)		
3. DEV	/ELOPMENT D/	ATA							EQUIPMEN	T MODELS			
l .	ge Method: \			_aw F				1.	HULLIS				
Mat	erials: Pump / B	ailer		BLADDI	ER Pur	OM A		2.	QPA M	150	-		
Mat	erials: Tubing/ F	Rope		LAPE	_ \			3.	-DI T NOCE	WLM			
Was	Was well purged dry? YES NO 4 70 I - 35												
Dev	Development Criteria:												
_		T	Cu-	J 4	25	3%	+ 100	1 10 4	1015				
	Flow Rate	DTW	Cum. Water	10.1	3 7 ₍₎ Temp /	Cond.	DRP/	00	10% Turbidity	Other	_		
Time	(gpm)	(ft. BTOC)		PH	('c)	(mS/cm)	(my)	(mg/L) /	(NTU)		Comments		
13 18	ML/MIN	38.00	(gail/1)	7 16 %					25.0				
	10.0	_	SOU	7.41	32.81	5.17	144	1,77	28.8		_		
13 23	100	28.00	(000)	7.53	23.50	3119	191	1175	14.7				
1328	(00	20,01	(500	7.58		5,20	138	1.24	10,8				
1333	100	28,00	2000	7.59	33,00		(37	1.33	9.8				
(3.98	เกิด	24.01	2500	7.61	32.62	5.18	135	1.35	8.9				
1343	(00	28.01	3090	7.65	32.65	5.18	133	1.37	7.6				
1348	100	27.49	35110	7.54	3269	5.16	132	1.32	6.0				
13.53	COU	27,99	Ztoch	762	33.13	5.19	132	1,34	6,3				
1358	(00	28,06	_	7.63	33.25	5.19	(33	1.31	6.2		0 T 4814 20		
1415	(00	24,47	1130	1 76 3	UJ123		_رون	(, (3)			AFTER PUMP		
1-6:7		24,17									rifek imili		
						71							
						8-17	-H						
	1												
4. SAN	I IPLING DATA								Ana	lute	Method		
	hod(s):				JEE A	DOVE			! □^`'''	VOCs	8260B		
	erials: Pump / Ba	iler			-		-	-		SVOCs	8270		
Mat	erials: Tubing / R	lope			-					Metals	6010B / 7000 Series		
DTV	at Time of Sam	pling:	_	7.2.0						TPH	80158		
	ple ID:		WEIM	108I-	So is as	•			<u>κ</u> α	SE C0	<u> </u>		
Dup	licate Sample ID:					Field Filter		NO	į U .				
5. COI	MENTS		(KED	SETING	urms	6/4	(124)	GO F1					
Note: 2-inch v	vell = 0.167 gal/f	t		4-inch well	= 0.667 aal/	'ft				_			
	340)					-	Signature	_		2			



1. PROJE	CT INFORM	ATION	a Bio c.C					WELL ID:	UFIW-U	<u> </u>	16.6.6
Project	Number: 1	19-076	00008	Task Numb	er: <u>02.0</u>	<u>' L</u>		Date: 8	17-11	- C + D D	Time: 1000
Client:	ルERT Location:	LAFICT 1	VE AP	- 6 Pris	V D			Personnel:	J. L.	1 Con	wind 95cF
			/ F (4)) [0.				weatner:_	70417	1 2000	2104 13
	DEVELOPME										
Method	i:	PUMP_X	Set on	BAILER	_	SURGE BLO	OCK Screen Len	1495	OTHER	- (1) 05	
Total De	epth of Well o Static Wate	(BTOC):	26 14	1	_		Screen Len Calculated	gth:	2 C	0 <u>0.06</u>	ft bgs
	o Static Wate o Product (B		س ا		_	ft. ft.:	Laiculated	casing voi.	3.45		gai
	of Water Col		21.42		_	ft.	Purge Vol. C	alculation (o	ne casing vol	. = 0.041*d ²	*h)
3. DEVEL	OPMENT DA	ATA							EQUIPMEN	IT MODELS	
	Nethod:			DW FL		a		1.	Horas	A . W-5.	ζ
Materia	ils: Pump) B	ailer	9	LADDER	bunk	TRO		2.	QED .	M+ 50	
Materia	ıls: (übing) I	Rope		PALE	~_			3.	JULIN	اسا ۱۹۳	M
Was we	ll purged dry	/?		YES	NO			4	BUI	35	
Develop	oment Criteri	ia:	-								
			Cum.	146.	7€/.	3%	± 10.0	wa	Lors.		T
Time	Flow Rate	DTW (ft. BTOC)	Water	10.{ pH	3 % Temp (*5)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	がか Turbidity (NTU) ファ. セッ	Other	Comments
1910	80	26.35	300	7.59	29.43	6.84	142	1.47	12.9		
10 16	80	28.42	[400	7.66	29.81	6.44	135	1.27	6.1		
1022	89	26.40	1500	7.70	29:52	6.98	132	1.42	3.1		
1028	08_	26.43	2000	7.70		6.91	13.0	1.39	1.2		
1034	64	26.44	250 €	7.70	29.55	7.10	126	1.43	0.1		STABILIZE
1050		28.16									AFTER PHMP
1											
1				JL						_	
			8-	17-16							
<u> </u>											
 	 										
\vdash	+								$\overline{}$)
\	+			ļ							/
				_/						_	
									`		
4. SAMPL	ING DATA								Ana	lyte	Method
Method	i(s):				SEE	Junoh				VOCs	8260B
Materia	Is: Pump B	ailer			_					SVOCs	8270
Materia	ls: Ubing / F	Rope			_					Metals	60108 / 7000 Series
	Time of Sam	pling:	of w							TPH	8015B
Sample			26,41	7		Field Files				aff C	00
<u> </u>	te Sample ID					Field Filter	$\overline{}$	NO	<u>. – </u>		
5. COMM	ENTS	- 	Q.E.D	JETIN	in CAN	√5 ° (660 E	V Ft			
							_				
Note: 2-inch well	= 0.167 oal/i	ft	13 (2)	4-inch well	= 0.667 aal.	/ft		3.0		1	
	. 2-4)						Signature:_			1	
										-	/



Client:_ Project l	ocation _	ATION 14-8760 Hender		Task Numb	er: <u>62</u>	8		WELL ID: Date: Personnel: Weather:		2.	Time: 1300	
Method Total De Depth to Depth to	pth of Well	PUMP (BTOC): er (BTOC): TOC):		BAILER	 _ _ 	SURGE BLC ft. ft. ft. ft.	Screen Len Calculated	Casing Vol.		-	ft bgs gal	
Purge M Material Material Was wel	DPMENT DA lethod: ls: Pump / B. ls: Tubing / B ll purged dry ment Criteri	ailer Rope 17		YES ,	(NO)	, i		1. 2. 3. 4	EQUIPMEN	NT MODELS		
Time	Flow Rate (gpm)	(ft. BTOC)	Cum. Water Removed (gal)	рН ±0.(Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments DOFFOU YSI	
Bail to 13 40 13 40 14 25 14 39 14 44 15 00	oby. fi	28.90	~19alb	7.62 7.75 7.75 7.82 7.80 . 7.90	29.84 24.58 28.44 28.44 27.54	6.53 7.27 7.56 7.68 7.80 7.87	164 194 196 197 200	2.26 081 1.18 1.85 0.78 1.91	Conne Same	ts of	2.1500 /S1 3.08 1.84 2.07 2.07 5 clear in it	high \$0.0
Method(Material: Material: DTW at 1 Sample II Duplicate 5. COMME	s: Pump Bass Tubing A Filme of Sam D: e Sample ID: e NTS	ope pling:	3ct lo	Buill	-20100	Field Filter	idn't		to dn		Method 82608 8270 60108 / 7000 Series 80158 COC:	



Project f Client: _	T INFORMA Number: 10 VEL	4-8760		Task Numb	per:	2.01		Date: 8-	HEMV 9-201- Ifao Sunny	6	1 Time: 1000]
Method Total De Depth to Depth to	evelopme to static Water Product (B of Water Col	PUMP (BTOC): er (BTOC): _ TOC):	39.32 27.79			SURGE BLC ft. ft. ft. ft.	Screen Len Calculated	gth: A. Casing Vol.	1.93			2
Purge M Materia Materia Was wel	DPMENT DA lethod: ls: Pump / B ls: Tubing / F Il purged dry ment Criteri	ailer Rope ?		YES	NO		•	1. 2. 3. 4	EQUIPMEN	T MODELS		
												-
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	亡(八) pH	Temp (°C)	士3% Cond. (mS/cm)	L70 ORP (mV)	1(% DO (mg/L) VS 1	全)學 Turbidity (NTU)	Other	Comments	
1033	120	28.01	0	7.64	24.68	6,52	181	1.80	20,5		ao from tors	Po
1037	170	28 0	480	7,55	29,82	6.53	178	1.30	6.7		0.0 Do from Ho	٠ ، ،
1041	120	28.0	960	7.62	29.86	6.53	169.	1.12	2,9		00 00	1
1045	120	28.01	1490	7.63	29.87	6.53	168	0.76	2,5		00	1
1049	120	28.01	1920	7,62	4.8	6.53	177	0.59	2,6		0,0	4
) 0 03	[20	283	2400	7.61	24,85	6053	166	0.53	24		0.0	-
1057	120	280	2880	7.62	29.84	6.52	164	0.56	1.9		0.0	-
					- /				(10		DIW-	-
Stable	COLL	Det S	unple	<u>.@ 11</u>	20 0	Frw-	017	•	4756	ray	027.25 / Les	4
									74			
										24		
											,	
Method(Material Material	s: Pump / Bass s: Tubing / R Time of Sam	lope	[imaAs] t		Hor B(4,44 LAP + 8,01	arping			Ana	VOCs SVOCs Metals	Method 82608 8270 60108 / 7000 Series 80158	
	e Sample ID:		VERW.	1-017 CP-61	-FD.	Field Filter	$\overline{}$	NO 165] <u>3</u> 0	DS1/	2	
												-
Note: 2-inch well =	0.167 gal/f	t		4-inch well	= 0.667 gal,	/ft		2-1-	=-71			_



Project N Client: _	TINFORMA Number: 16 MPRT .ocation:	14-8/60	erson		oer: _02,	01		Date: 8 -	UFMD- -9-16 -100 5 Sunny	<u>.</u>	Time: 063.7.	
Method Total De Depth to Depth to	EVELOPME the of Well of Static Water Product (B of Water Col	PUMP (BTOC): er (BTOC): _ TOC):	21,2	BAILER	——————————————————————————————————————		Screen Len Calculated	gth: 44 Casing Vol.	OTHER		ft bgs 48,62fc	et/>
Purge M Material Material Was wel	PMENT DA ethod: is: Pump / B: is: Tubing / F I purged dry ment Criteri	ailer Rope v?		YES	NO			1. 2. 3. 4	EQUIPMEN	T MODELS		
Time	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed	ナの,/ pH	Temp ('C)	#395 Cond. (m5/cm)	≟(O ORP (mV)	#(8% DO (mg/L)	Turbidity (NTU)	Other	Comments ∴10%	
0925	100	26.80	0.0	7.52	29,5	7.11	211	2 32	64.0		4.84 120 fronts	zee
0830	100	26.70	500	7.92	29.33	5.74	206	3 22	64.2		4.76	
0835	100	26.70	1600	7.92	7921	6.75	200	3.34	39.9		5.00	
0840	100	26.70	1500	7.94	29.21	6.74	192	3.60	£7.3		512	
0845	100	2670	2000	7,53	24.12	6.75	127	2 29	4.0	_	5.14	
9800	100	2670	2500	7,55	2513	674	185	233	481		5140.	
0855	100	26,70	3000	7.46	2911	674	181	3.40	40.8		6.25	
1980	100	26.70	3500	7.97	2918	674	180	3.46	362		5.64	
0905	100	2670	4000	7.98	29.22	6.73	174	3.61	33,6		6.31	
0410	160	2670	4500	797	29.21	672	190	3,54	33.0		6.26	
Stuble	- Coll	æ s	umple	UFN	W/- E	ui) हि	095	Ó			PTW after Soup =27.89 +600	2mg
										84		
				-								
Method(Material: Material: DTW at 1 Sample II	s Rupip / Bas s Tubips / R Time of Sam	lope pling:	4FMn	365 265	flow dder bubin	Field Filtere	ed: (YES,) NO	Ana	VOCs SVOCs Metals TPH		
NYU = 0.0 (YSI 55 t	20-7 (al	1140 mg	GR.	103, 19 103, 19 50015 4-inch well	6 po (16	/ft	Columbia rattal b	(240)		D 100	cond=24.5314.44 m	ilcm)



	Project Client:	Number:	64-87		/	per: <u>D2</u> .0	<u> </u>		Date: Personnel	VEMV 8-10-1 Llas	6 X P	Time 1310	_
2.	WELL D Method Total De Depth to Depth to	EVELOPME	PUMP (BTOC): (BTOC): (TOC):	29.69 27.69	BAILER		SURGE BLO ft. ft. ft.	Screen Len Calculated		OTHER		ft bgs Setpu	np 26
3.	Purge Materia Materia Was we	DPMENT DA lethod: ls: Pump / Bi ls: Tubing / F ll purged dry ment Criteri	ailer Rope 17	11,2	YES	/≥\$# NO	<u> </u>	874	3c %.	EQUIPMEN	NT MODELS		
	Time	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed (gal)	ph ±0.1	Temp	Cond. (mS/cm)	ORP (mV) ⊒-i0	主に多 00 (mg/L), Hのけわ	土 10万 Turbidity (NTU)	Other	Comments	
-	1443	100	2769	0.0	7.18	32.9	10.3	130	12,	26,2		2.741001	rsi
	1448	100	27.40	500	7.34	3213	10.2	132	1,44	65		3.46 DO Y	T
L	1452	100		1000	7.39	3188	10.2	141	1.8	120		4.11 DO V	SI
	1458	100		1000	730	31,55	10.2	149	1.90	12.6		178 Do 4	SE
4	1503											1	
L													
		<u> </u>											
\vdash									000		00-1-		
⊢										- PUM			
<u> </u>						Ye	NIBL	- Dr	HITCH	TOH	4NP	BALL.	120
┢╾	1553				127	~ ~	(/5		1/	8-15	16		
	1520		<u> </u>		7.23	39.P	603	2/	5.14	1713			1.6
├	124				1. 20-	20.54	14.7	704	3,52	00	14	S. V.	
1	134				7, 26	413	1//5	201	41/5	0,0			-
4.	1530 153AMPL	NG DATA			7.6	71.13	143	206	24	O.V C.CAna	luta	88-45-4	
[Method				SPE	PauD ~	2	سم	T=		VOCs	Method <i>82608</i>	
		s: Pump / Ba		,		· •					SVOCs	8270	
		s: Tubing / R Time of Sama								: H	Metals TPH	60108 / 7000 Se	ries
	Sample		ринц.								IPH	80158	
		e Sample ID:				· ·	Field Filter	ed: YES	NO		. (1 1	
5. -/-	commi	ents /	430	ng/L	19 N	57, 50	; DO:	40 10/	, 40=	90,8	3/93	altidg,	عامرا ي
F	Tarbidlto	read	mi o	nt of	tange	, too.	tur bild	<u>_ </u>					
1	e: 2-inch well				4-inch well								



					As I would not					11		
1.		TINFORM	ATION P	10# 14	4-31600	vo) 3 ² - (2	.01			UEMA		Time: 1310
l	Project I Client:_	Number:	700	964	Task Numl	per:	-			8-10-		Time: 1515
	_	Location:		WESH !	พ/					1-10-0	1~1	000-
									weather:	Sulve		
2.		EVELOPMI									7	
	Method				BAILER			оск		OTHER		
	Total De	pth of Well	(BTOC):		_	_	ft.			to		ft bgs
			er (BTOC): _			_	ft,	Calculated	Casing Vol.			gal
			TOC): lumn (h):			No.	ft. ft.	Buren Val. (Talaulasian (s	ne casing vai	0 04184	· est
<u> </u>			2.0			-/-	11.	rurge voi. c	.orcaration (c			
3.		PMENT D	ATA			1				EQUIPMEN	IT MODELS	
	Purge M		aila-				1		1.			
		ls: Pump / B ls: Tubing / I					1	•	2. 3.			
		l purged dry	-		YES	NO	1	•	3. A			
					163	110			7			
	Develop	ment Criter	ia:									
				Cum.		1	1		<u> </u>	r		<u> </u>
	Time	Flow Rate	DTW	Water	pH	Temp	Cond.	ORP	00	Turbidity	Other	Comments
	******	(gpm)	(ft. BTOC)	1	pri	(,c)	(mS/cm)	(mV)	(mg/L)	(UTU)	<u></u>	l .
	15->		<u> </u>	_(gal)	1 22	<u> </u>	<u> </u>		26		mis.	tooturbid-
Ш	735				7.25	77.11	10.2	212	2.79	8.0		
1	<u>535</u>	· ·			7.14	17.00	103	115	214	0,0		
	1537				3.15	77.0	10.3	219	1.89	0.0		
				~ 1.09a		1						
¥	wit til	Lthe	M YOU			covere	d 40	27.87	all ha	- 18:	0/ 1-	muery)
 '								1 10 = 5	700	0407	10 / E	wreky)
H	Then	Bowl	<u>-₹-o</u>	cone	F 70	mple	* CC - IV	0.0	25	01603	10	
_						V	1.5					
					<u> </u>							
												<u> </u>
											_	
	-									_	70	
				_								
4.	C 8 8 4 8 1 1	NC DATE										<u> </u>
4.		NG DATA		Purpe to	⇒ 81					Ana	-	Method
	Method(s): s: Pump / Ba	and a	COC II	32 Pail						VOCs	8260B
		s: Tubing / R	~	•							SVOCs	8270
		ime of Sam	\ /		2718	7					Metals TPH	60108 / 7000 Series 80158
	Sample II	er.		Y FMU	-1925	-201103	3/0	tooto	rad			C0 C.
		Sample ID:		NA		20100	Field Filter		(NO)		~ ()	
5.	COMME	NITC		7	11.	len -	1	- PA			_	
J.	COMME	1412	Pm 12	lw bi	مرب لم	Leci	CAMA	Jul .	-110 E	rany	·	5.) 7216-6.
			Samp	K AS	Daf Assign	EVECL						
Moto:	2-inch well =	0.167 1/6			4.1611	= 0.667 gal/			1.7			

Signature: ___

Revised 7/13/16
General\Forms and Templates\Field Forms

Pg 2 of 2



1. PROJECT INFORMATION Project Number: 194- Client: VERT Project Location: How	8760008 deven , M		er: <u>P.</u> (<u>-</u>		WELL ID: 1/2 Date: 8/2 Personnel: Weather: 1	-10 - 16 1-1a=		Time: 1000
2. WELL DEVELOPMENT LO Method: PUM! Total Depth of Well (BTOC Depth to Static Water (BTOC Depth to Product (BTOC); Length of Water Column (I	39.08 c) 27.68	BAILER	- -	IL.		gth: 340 Casing Vol.:			fi bgs Setpurp 36, 5
3. DEVELOPMENT DATA Purge Method Materials Pump / Bailer Materials Tubing / Rope Was well purged dry? Development Criteria:		YES	NO	+2		1. 2. 3. 4	EQUIPMEN	T MODELS	
Time Flow Rate D7 (gpm) (ft. B		pH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
1020 100 28		7.65	3234	7.30	206	0.82	780		1.07 PO YS7
1025 100 28	01 Zoo	7.58	30.10	7.41	20	925	36.5		0.85
	(200	7.64	30,702	7,42	199	0.09	246		0, 6, 0
1035 100 28	*	765	30,10	7,43	188	002	17.8		0.6 7
10 40 100 28		7.67	30,18	7.43	183	১৩০	119		0,62
1045 100 28		7.66	30.30	7,44	431	0,00	7.0		0.63
1050 100 28		7.63	30.46	7,45	181	0.00	3, 5	_	0.66
10ts 100 23?		7.64	30.49	7.45	119	0,0	48		<i>D.64</i>
1100 100 28.	31 4000	7.60	32.60	7,45	/30	වැටෙ	1.6		0.60
Statle collect.	2010	47 n As 4	/	2.5/	/ D. D	6			07
same ponter.	cumple	17-MM	75/2	-2010	00 810.		1140		10.875 A
		7,2	-7. v	6-6-5	211	5,44	. A J 60	Silvy	Ing D' (W=1):87
4. SAMPLING DATA							Ana	-	Method
Method(s): Materials: Pump / Bailer Materials: Tubing / Rope DTW at Time of Sampling: Sample ID: Duplicate Sample ID:	MEINN	1314 LD 28.0	How dder P.	Field Filtere	ed: VES	NO		VOCs SVOCs Metals TPH	82608 8270 60108 / 7000 Series 80158
5. COMMENTS	SED	5060	y C	2M6	501	5.0/16	5	Bopsz	
Note: 2 inch well = 0.167 gal/ft		4-inch well =	0.667 gal/j		Signature	Н.,		7h	



Pr Cli Pr	roject N lient:	VER :	14-8761 Jender			er:_02.	0		Date: 8	MW-02 -10-14 2440 Swnny	8.	Time: <u>0630</u>	
M To De	lethod: otal Dep epth to epth to	Product (B	PUMP (BTOC): er (BTOC): _	49.0 27.70 21.3	<u>*</u>		SURGE BLC ft. ft. ft. ft.	Calculated	Casing Vol.	OTHER		ft bgs Se& Pormos CHE gal *h)	78 July
Pu M M W	urge Me laterials laterials las well	PMENT DA ethod : Pump / B : Tubing / f purged dry ment Criteri	ailer Rope v?		YES	NO			1. 2. 3. 4	EQUIPMEN	T MODELS		
Time		Flow Rate	OTW (ft. BTOC)	Cum. Water Removed	pH fal	Temp	Cond. (mS/cm) ±396	ORP (mV)	生10% DO (mg/L) Headha	±j0名 Turbidity (NTU)	Other	£10% Comments	
0816	ì	100	28,05 28,05		7.8	24.73 24.38	8.04	20t	0.51	42.1		1.04 potronysz 0.91 potronys	,
082		100	28,05	1000	7.82	29,30 29,21	8,03	194	0.00	18.7		£68	
0831		100	28.05	2000	7.78	29.2	8.0)	190	0.00	14.3		0.69	
084	6	100	28.05	3000.	7.76	29.28 29.34	8.02	187 181	0,00	72		0,64 0,£1	
085		100	28.05	3500	7.81	29,40	2.01	174	0,00	5.9		0.60	
085	-	100	28.05		7.81	29.39 24.39	8.02	171	0.00	5.6		0,57 0,58	
					, ,								
Stey	He.	Couoe	e sichi	mpre	WHW	V-U2	<i>D</i>					DTW-2805	
												DTW = 27.85 after this shy s	mphy
Mi Mi DT Sai	ethod(s aterials: aterials: IW at Ti mple ID	: Pump / Ba : Tubing / R me of Sam	lope pling:	UFM		flow adder ob 05 0 - 2011		evel 4.	fins/mc	Ana	VOCs SVOCs Metals TPH	Method 8260B 8270 6010B / 7000 Series 8015B	
1 .	OMMEI 10 (24) 58 1 well = 1	3.7	CP1016	50/4	Auth S ndugily 1=94 -0 16 4 inch well	14456 01936)	Homela 449 m S/ White Signature:		- La- Ca	utdal V lo.0)	Solution 1,7.5 / My/LDO, 101 1 first ready 57,2	-0% DO 1 mg/LQ27.5



1.	Project N Client: Project U	T INFORM	ation 14-87 Fendo	6000B	Task Numl	oer: <u>22 -</u>	0/_		WELL ID: Date: 8 Personnel: Weather:	-8-20	16 2. 1. Mod	73.5 Time: <u>153.5</u>
3.	WELL D Method Total De Depth to Depth to Length o	EVELOPMI pth of Well o Static Wat o Product (B of Water Col	ENT LOG PUMP	5.88 Dru	BAILER		SURGE BLC	Screen Ler Calculated	ngth: 24 Casing Vol.	OTHER	255 =0.041*d2	ft bgs gal
	Material Material Was wel	s: Pump / B s: Tubing / I I purged dry ment Criteri	Rope /?		YES	NO			2. 3. 4			-
	Time	Flow Rate (gpm)	OTW (ft. BTOC)	Cum. Water Removed (gal)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
	Well	and.										
	- 1	(C)						_				
-		<u> </u>	 			23				 		
-												
_		ļ <u>.</u>				-			<u> </u>			
										\vdash		
		<u> </u>										
		<u> </u>				<u> </u>						
											100	
4.	Method(Materials	NG DATA s): s: Pump / Ba s: Tubing / F		-					J) i	Ana	VOCs SVOCs Metals	Method 8260B 8270 6010B / 7000 Series
	Sample II	ime of Sam D: 2 Sample ID:		No Sam	yde col	ecred	Field Filters	ed: YES	NO		ТРН	8015B
5.	СОММЕ	ENTS	•	Weild	m,	total c	क्रिभा द	25.8	8 44 21	toc. No	, GIV	meantined
Moto:	2 inch wall -	0.167 001/4	*		A Inchall	0.663 ==1	/60			•		
wote.	2-inch well =	U.107 YUI/J			4-men well	= 0.667 gal,		Signature	Н	as]	2	

Revised 7/13/16
General\Forms and Templates\Field Forms

Pg of



Project N Client:	MERT	ation 194-8760 Hender		Task Numb	er 02.	01		Personnel:	UEM 2-8-11 Hao Sunn	Z. 8.	Time: 1300
Method: Total Dej Depth to Depth to	evelopme pth of Well Static Wate Product (B of Water Col	PUMP (BTOC): er (BTOC): TOC}:	40.3			SURGE BLC ft. ft. ft. ft.	Screen Len Calculated	gth: <u>20,3</u> Casing Vol.:	22		
Purge Mo Material Material	ethod: s: Pump / Bas: Tubing / F	ailer Rope		YES	NO		· ·	1. 2. 3. 4	EQUIPMEN	T MODELS	
Develop	ment Criteri	a:						<u> </u>			
Time	Flow Rate	DTW (ft. BTOC)	Cum. Water Removed (g al)ys .	#£0. (pH	3% Temp (°C)	Cond. (mS/cm)	エル ORP (mV)	10/0 00 (mg/L) Heriba	10/0 Turbidity (NTU)	Other	Comments
1414	100	27.15	0.0	7.66	36.47	6.76	176	422	1.2	· ·-	0.62 DO From YS
[419]	100	27.15	500	7.66	34.80	6.80	769	3.39	11.7		0.76
1424	100	27.18	1000	7.61	34.17	6,81	167,	2.89	3.8		1.07
1429	100	27.18		761	33.97	679	166	2,75	3.0		0.86
1434	100	27.18	2000	762	33.53	6.87	. 162	3.33	1.9		0.82
1439	100	27.18	2000	7.6	33.58	6.84	158	1.57	8.6		0.78
1444	100	21.18	<u>কেত</u>	7.63	3314	6185	156	1.72	0.7		0.76
1449	100	27,18	2000	7.62	33.4	6.83	156	1,65	0.4		0.67
1454	100	27.18	3000	7.61	33.42	6.84	155	1.51	Ů.Ď		0.6)
1459	100_	27.18	4500	7,64	22/18	6.8g	752	1,30	D. 0		0 /2 8
Stable,	colle	ted.	amp	le WF1	ルルー	037	&)	510			
										1.e	9
	NG DATA			L.a	w Ho	لرور		į	Ana	•	Method
Method(Materials	s Pump /⁄ Ba	ailer			adde					VOCs SVOCs	8260B 8270
DTW at T Sample II	s: Tubing / Fi fime of Sam D: e Sample ID:	pling:	UFMU	-LA	7.18	Field Filter	ed: VES) NO		Metals TPH See	60108 / 7000 Series 80158
5. COMME	NTS		03.8	efting	CPr	16 9	0/5.0	(165)	125 P	ا <u>د</u> اح	
Note: 2-inch well =	0.167 gal/f	t		4-inch well	= 0.667 gal/	/ft			CIN.	71/	



Project I Client: _ Project L	TINFORMA Number: 19 MERT .ocation:	4-87600 Hender		Task Numb	per: <u>C2</u>			Date: 2- Personnel: Weather:		16 Z. 7~9	Time: <u>0830</u>
Method Total De Depth to		PUMP (BTOC): er (BTOC): _	47.0	9				gth: 45 Casing Vol.:			ft bgs 586 Purp (5) (‡) gal *h)
DEVELO Purge M Material Material	PMENT DA	ATA ailer tope		YES	NO	-		1. 2. 3. 4	EQUIPMEN	IT MODELS	
Develop	ment Criteri	a:									
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	土0.) pH	3% Temp (°C)	3% Cond. (mS/cm)	乏し ORP (mV)	10% DO (mg/L)	10% Turbidity (NTU)	Other	Comments
1042	100	27.11	0	7.75	32.26	7.4	[97	2.129	11.8		1-29 00 Non Hariba
10 47	100	27.12	,500	7.73	31,42	729	189	1.82	0.0		1.40-
10.52	100	27.12	1000	777	3/,20	7.3]	187	2.34	0.0		1.47
1057	100	27-12	1500	7.74	31.03	7.34	181	1.28	0.0		1.56
1102	100	27.12	5000	7.76	30.40	7,34	175	4.49	2) D.O		1,74
1107	100	27.12	2500	7.76	31.03	7.3]	(72	824	0.0		1.86
1112	100	27.12	3000	777	30.10	7.33	170	2.56			1.95
1117	100	2/12	3500	7.75	30.65	7.36	169	2.52	0.0		2.03
Stuble	Coll	ect s	ample	UFM	W-03	D 😡	1125				DTW=27.16
CAMBII	NG DATA								<u> </u>	lida	# # a A b a all
Method(Materials Materials		ope	-	B	udder ubmy	ow _			Ana	VOCs SVOCs Metals TPH	Method 82608 8270 60108 / 7000 Series 80158
Sample II Duplicate	D: 2 Sample ID:		urmw.			Field Filtere	ed: YES) NO		see	COC
COMME PH=4.02 DO render DEO SEH	(4.0)	Horiba DN 6	1.53 (1 in wh 5.0/5.0	149 mg	1-52 W 2/cm) -100P = 0.667 gal/	JTN THI SZ	1 = 0.01	onkor o.o) T	With e	VL 00	Schibign Of



Project Client:	NERT	1947876				<u>0 l</u>	_	Date:	45/19/1 1: Clau	<u></u>	Time: <u>082 5</u>
2. WELL Methor Total D Depth 1	DEVELOPM d: epth of Wel to Static Wa to Product (29.4	BAILER_	Υ	SURGE BL ft. ft. ft. ft.	Calculated	ngth: 24.6 d Casing Vol	OTHER	7 <u>24.4</u> (gal
Purge N Materia Materia Was we	OPMENT D Method: als: Pump /d als: Tubing / all purged dr pment Criter	flope	_	ai/ vine YES	NO		-	1. 2. 3. 4	HORE		
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	Hq	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
2900		27.75	_	81.8	26,04	4.99	111	188	41.0		·
4090	-			8:05	25.87	5.04	124	1.34	193		
0914		_		7,93	25.88	4,89	(2kg	0.74	185		
0921	-	_	~	7.86	26.00	4.81	128	0.84	175		
U918	_	28.00	>1.0	7.91	25.45	4.8	133	0,96	196		3 WELL CAING
											VOLY ME ACHIOLE
	 										
							ਹ।				
							K-14-	6			
			_/								
Method(Materials Materials DTW at T Sample II	s: Pump \ Ba s: Tubing \ R ime of Sam	op pling:	19AUL	- ONS-	rence	AROVE	d: (YES	NO	Anal	yte VOCs SVOCs Metals TPH SEE CO	Method 82608 8270 60108 / 7000 Series 80158
СОММЕ	NTS										
ote: 2-inch well =	0.167 gal/ft		4	1-inch well =	0.667 gal/f	'n				_	
					- 12		ignature:		1		7



Project L	T INFORM.	4-2-76 WQ 4 [JE AA	Task Numb	her: <u>U2</u>	01		WELL ID: Date: Personnel: Weather:	-18-16	_	Time: OKS
Method Total De Depth to Depth to Length o	EVELOPME : pth of Well o Static Wate o Product (B of Water Col	PUMP (8TOC): er (8TOC): _ TOC):	39.4 27.7	6		SURGE BLC ft. ft. ft. ft.	Calculated	gth ペゴイ、i Casing Vol.	1.55		ft bgs gal
Purge M Material Material Was wel	ethod: ethod: s Pump / B s Tubing / I I purged dry ment Criteri	ailer Rope '?		LDP F	R PH	P PRO		3.	HUR4	er why	82
Time	Flow Rate (gpm) ML/K	DTW {ft. BTOC}	Cum. Water Removed (gai) 41-	101 pH	3 % Temp	Cond. (mS/cm)	ORP (my)	40% DO (mg/L) 70.5	10% Turbidity (NTU),	Other	Comments
0903	100	27,88	800	7.59	27.59	4.44	164	1,77	38.3		BATTERY REPLACES
2910	100	27.88	1000	7.17	21.32	4.26	149	1.46	24,5		
14 15	ार्यच	27.10	1200	7,74	21:06	4.27	141	1.71	17.8		
v 430	tot	-	\$00 d	7.76	29.05	4.27	138	a. 01	189		I
1425	100		2500	7.79	29.10	4.27	13.)	1.93	11.7		
0470	100	11.0	3000	7.79	29:14	4.27	131	2.00	11.9		
1935	190	27.88	3500	7.80	14,04	4,19	128	2-05	1144		
1940	100	27.40	4000	7.84	29.16	4,28	125	2.12	12.0		STADILIZED
020		27.76									LETER PLUMP
7											
							-dL	_			
							C-18-	ε,		,	
							_				
Method(Materials	NG DATA s): s: Pump / Ba s: Tubing / R		•		932	ABU1	<u>ie</u>			VOCs SVOCs Metals	Method 82608 8270 6010B / 7000 Series
DTW at T Sample II	ime of Sam	pling:	4 FMW	1-04I	-20100 -20100	818 Felly Filter	ed: YES	NO		TPH SEE CU	8015B
. COMME	NTS		NED	CMI	6/6 (090	20 F	1			
				·							
	0.167 gal/f				= 0.667 gal/					_	



										I Free .		
1. F	PROJEC	T INFORM	ATION 14-77	Clabot &		on.	0.1		WELL ID:	AFAW - E	240	C/270
P	Project N	lumber: L	(TE THE	00000	Task Numb	er: V 4	-		Date: 8	10-4	CAND	Time: 0720
	Ilient: _	IABLI	WEST	ME AB-	C ALA	16			Personnel:	CLOUD L	+ (s. A) + (F SLIGHT WHY
P	Project L	ocation:	WMI	या सम	2 101				Weather: _	UCU	טן ד	P D T WHAT WHY
		EVELOPME						_				
	Method:		PUMPX	LIA D	BAILER	_	SURGE BLO	CK	. actus	OTHER	wu ta	* 1
		oth of Well		27.8	<u> </u>							ft bgs
			er (BTOC): _			_		Calculated	Casing Vol.:	3.65		gal
		Product (B		21.	72	_	ft.				0.0444-13	46.3
	ength o	r Water Col	umn (h):				ft.	Purge Voi. C	aiculation (o	ne casing vol	= 0.041 a	-n)
3. [DEVELO	PMENT DA	ATA		35 / E	Salar I				EQUIPMEN		
	Purge Mo				_dw F				1.		V-1	<u></u>
		s Pump / B		R	LDPG V HODEN	Ww	1 MICO		2.	GED		
		s: Tubing / F							3.	301	ST WL	, M
\ \ \ \	Nas well	purged dry	17		YES	(P)			4	902	-33	
0	Developi	ment Criteri	a:	<u> </u>								
_												
		ML/~		Cum.	101	340	3 40	#10.0	10/49	10/10		
Tim	e	Flow Rate	DTW	Water	pH	Temp	Cond.	ORP	DO	Turbidity	Other	Comments
		(gpm)	(ft. BTOC)	Removed (gal) M	· /	('0)	(mS/cm)	(mV)	(mg/L) /	(NTU)		
1220	12	(01)	27.85	500	7.47	29-24	5.0	169	1.54	395		
074		100	22.85	1000	7, (7	2725	5.05	ISI	1.08	13.1		
17 5	1	100	27.85	1500	7,78	27.43	5.04	140	0,81	6.4		
07/2	-	100	27.85	2000	7.31	27.69	5.03	134	0.88	4,0		
080	11.	100	27.85	2500	7.77	J.7.95	5.06	129	0.93	3.0		
080		100	27.85		7.79	3801	5,04	130	0.95	0. 1	-	STABILIZED
012			27.13			A						AFTER PUMP
1			,									
											_	
			_					JL				
								8-16-	u			
						_		- 20	-			
										_		-
	+										•	
⊢—												
				Ĺ <u></u>	L							
		NG DATA				SEE	ASOUF	<u> </u>		Ала		Method
	viethod(400	Model	,	_		VOCs	82608
		europ / Ba									SVOCs	8270
		: Jubing R	•		77	0.1			_	님	Metals	60108 / 7000 Series
l .	ample (ime of Sam	pung; T	AFMY.	- 1111 -	ZOILUS	1X	~	\		TPH	8015B
		ບ: e Sample ID:		~	040-	MUNL VA	Field Filter	ed: YES	NO		-00	<u></u>
		<u> </u>		0 =:						<u> </u>		
174L1	RK A	ישוי לשוי	3.93 pt	1 7	·3 L W	14 YEAR	7.61	nyr(L,	10390	00		
				·								
Note: 2-inc	h well =	0.167 gal/f	t		4-inch well	= 0.667 gal/	/ft	77 0				
								Signature		1		



WELL DEVELOPMENT LOG DATA SHEET (CONT.) 300 sing roling alix 3

2 = برا T D = 2	27.90	FT Q	V	TO =	29.81	FT B	هر			•	
1. PROJEC	TINFORM	ATION	20008	788.4	41	Λ.Ι		WELL ID:	U Finu	<u> </u>	
Client	Number: 14 NER					-01		Date:	8/19/1	_ما	Time: <u>0930</u>
Project l	ocation:	West of	A12-	5 Por	nd -			Personnel Weather	Cloud	nate is	
								- veather.			
Time	Flow Rate (gpm)	DTW (ft. BTOC)	Cum. Water Removed (gal)	рН	Temp (°C)	Cond. (m5/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
0933			1	8.28	26.62	5.97	129	1.07	100		
0 94 5				8.23	27.01	8400	109	7.72	1101		
0951 1000 1017				8.20	25.88	4.98	2005	11/6	245		In above 100 mills
1000				1.77	1 25.10	1.28	59	6.91	184		71 Gallon
1017				8.14	2666	5.65	31	1.13	205) Glattor
1019		28 28	>1601	_				117	UVS		
	,		7 1001								2-
-											
-											
									-		
			-								
	_										
		- 									
											
										T	
											9
										-	
COMMEN	ITS										

Signature:



GROUNDWATER PURGE AND SAMPLING FIELD DATA SHEET

4										AIA SI				
1.	PROJE	CT INFORM Number:	IATION		le.		WELL ID: UFMW- 051							
1		Number: []		_ Task Numb	oer:			Date: 8-2	3-16		Time: <u>0700</u>			
1	Project	Location:	Mendar	roa als/			Personnel: D. KEADY, E. PEIRCE Weather: Sunny, 105°F, Windy							
			TICILATE I	serry (NV				Weather: _	Sunny,	102 T	Windy			
2.	WELL (_					_						
	_	Diameter: _		_in.			Type of Casing:							
		e: <u> </u>		in.	C.		Type of Screen: PVC							
		epth of Well		39.7		_ft،	Screen Length: 274.75 to ~39.75 ft bgs							
		o Static Wat		N/A		ft.	Calculated	Casing Vol.:			gal			
l	-	o Product (E of Water Co		11.93		_ft. _ft.	0	ent to the						
<u> </u>			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1	, IL.	Purge voi. (Calculation (o	ne casıng val.	. = 0.041*d - 1	'h)			
3.	PURGE				ایس		- a			IT MODELS				
	_	Aethod:			Flow			_ 1.		4 U-52				
l		ols: Cump / B			Samp k			- 2.	ARE 2					
		ols: Tubing/	Rope	-	Bondes	44"TI	لاملا	_ 3,		st 104				
	Pumpin	ig nate: ill purged dr	2	YES	0 4	<u> </u>	mL/Min	4.	Mr.S	<u>o</u>				
	AA92 ME	ai baiRea ai	yr	153	<u></u>			5.						
		DTW	Cum. Water	10.l	37. Temp	3%	± lo	10%	Turbidity	10%				
Tin	10	(ft. BTOC)	Removed	pН	(,C)	(mS/cm)	(mV)	(mg/L)	(NTU)	Other YAL Do	Comments			
		((mL)		(4)	(1110) (111)	,	(TINE)	(1410)	100. 100				
072	0	28.00	500	7.71	26.91	13दिः श	135	0.68	733	1.14	(ond = 5.39 ms/c			
072		29,00	T DATE OF	7.69	26.78	5.46	135	0.60	59.4	0.80	(414[0-3,5]114)			
								1						
073	_	28.00	1500	7.70	76.47	5.47	133	0.53	37.0	0.76				
0735	_	28.00	2000	7:71	26.49	5,44	130	0.62	33.5	1.27				
074	<u>0</u>	28.00	2500	7.72	26.53	5.41	128	0.47	20.2	0.89				
0749	5	28.00	3000	7.76	26.97	5.41	125	0.39	15.5	0.73				
075		28.00	3500	7.79	76.51	5.40	122	0.34	12.5	0.73				
015		28.00		774	24.54			0.32						
			4000	7.17		70	121		10.3	0.76				
080		28.00	4500	7.79	26.54	5.37	120	0.31	8.5	0.75				
0805		28.00	5000	7.76	26.55	5.37	121	0.31	8.1	074				
0810]	78.00	5500	7.81	26.57	5.37	119	0.32	7.8	0.76	STABLE			
					ا				_		ЭШвес			
							1	N - 0	2.22 /	•				
								45 8	23-					
4.	SAMPLI	ING DATA		_				' -	Ana	lyte	Method			
	Method	(s):		Same	as also	VL				VOCs	8260B			
	Material	ls: Pump / B	ailer	- 1						SVOCs	<i>8270</i>			
	Material	ls: Tubing / I	Rope							Metals	6010B / 7000 Series			
		Time of Sam		28.0						TPH	80158			
	Sample I	ID: V	LWM-06	I - 70160	823 08	20	1	,		SEF CO	<u> </u>			
	Duplicat	e Sample ID	<u>: ~//</u>	<u>~</u>		Field Filtere) NO						
5.	COMMI	ENTS					torp	erchlarate.						
<i>J</i> .	COMM	E1412												
	~									51.5				
Note: 2-in	ch well =	= 0.167 gal/j	ft	4-inch well	= 0.667 gai/	ft			5 1		a 14			
							Cignatura		1 - 1-					



GROUNDWATER PURGE AND SAMPLING FIELD DATA SHEET

2 2001	FCT INCORN	1471011						. 1 E VINI				
I .	ECT INFORM		<u>.</u>	k	10	WELL ID: 17/11W - 05D Date: 8-22-1/ Time: 1340						
	t Number:		ask Numb	oer:	<u> </u>					Time: 1340		
1	NERT	Hend	ellon	NV		_	Personnel:		re, D.			
	t Location: _	LHXIV	VUVIII	14.4			Weather: _	SUMMI	100-	WHY		
	DATA	7					5/12	Site		7		
	g Dlameter: _		_in.			Type of Casing:PVC						
T	ze:		in.			Type of Sci	reen:	YG				
	Depth of Well		49,70				igth: ~44 3		4970	ft bgs		
	to Static Wat			2		Calculated	Casing Vol.:			gal		
4	to Product (E h of Water Co		N/A	N 7	_ft.							
	n or water co	iumn (n): _	46,	J	_ft.	Purge Vol. (Calculation (or	ne casing vol.	= 0.041 °d °	*h)		
3. PURG	E DATA			-4					IT MODELS			
_	Method:			v Flow			1.	Hom	09 V-5	2		
1	ials: Pump/ E			D Sam	ple Pre	2	2.		55			
1	ials: (ubing/	Rope	- Yoly		ed 14	-	3.	<u>So1.</u>	M3- Or			
	ing Rate:	_	100			mL/min 0	4.		50	•		
Was w	ell purged dr	γ?	YES	NO			5.					
	200	Cum.	±0.1	3%	3%	ORP ORP	10%	10%	10% Other			
Time	(ft. BTOC)	Water Removed	pH	Temp (*C)	Cond. (mS/cm)			Turbidity		Comments		
	(11. 51 50)	(mL)		(4)	(mayem)	(mV)	(mg/L)	(NTU)	REDO			
1400	27.81	0	7.72	33.21	591	119	0.69	OODE	1.28	Turbidity Awking		
1405		500						_		Ingals Holly		
	27.81		7.73	31.24	6.10	111	0,33	228	0.73	V		
1410	Z7.80	1000	7.71	31.06	6.12	109	0.26	152	0.70	Hariba DO unreliable		
1415	27.80	1500	7.71	31.10	6.08	106		90.7	0.64	relying on YSI DO		
1420	27.80	2000	7.70	30.93	6.11	105		72.5	0.57	0		
1425		2500					 					
	Z+.80		7.71	30.94	6.09	103		51.3	0,55			
1430	77.80	3000	7,71	30.88	6.12	[0]		46.3	0.52			
1435	27,80	3500	7.72	30,80	6.10	99	-	44,2	0.48			
1440	27:80	4000	7.72	30,77	6.11	98	_	39.9	0.50			
1445	27.80		7.73	30.81		96	~					
					6.10			379	0,52			
1450	27.80	5000	7.73	30.97	6.1)	94		35,4	0,54			
1455	Z7.80	5500	7:74	30.98	610	93	_	34.8	0,55	STABLE		
			•									
	1					3- 57	22-16					
	1					X .	22-10					
4. SAMP	I I											
	LING DATA		0		f		ļ	Ana	lyte	Method		
Metho	• •	niles	_304	me as	above				VOCs	8260B		
	als: Pump / B als: Tubing / I	-							SVOCs	8270		
	ais: Tubing / I t Time of Sam	•	77 0	<u> </u>				님	Metals	6010B / 7000 Series		
Sample			77.8		ICAT		i		TPH	8015B		
,	ate Sample ID	FMW-C	120-10	160722	Field Filter	ad. Ace	NO NO		SEE C	OC .		
				•	THE OF THE ET		erchlorate					
5. COMN	/IENTS	- :-				10.5	Contraction of the		-	-		
								<u> </u>				
				_								
									1			
Note: 2-inch wel	l = 0.167 gal/j	ft	4-inch well	= 0.667 gal/	•		1	7	1665			
						Signature:		、レン				

Revised 12/22/15



WELL DEVELOPMENT LOG DATA SHEET (CORT.)

DTV=27.56 FT AGI TO = 21.80 WHER COMMY = 2,24 FT

Project Client:	Number: 1 NER Location: 1	94 - 8760 T			per: _ <i>02</i> -	01	o oppor	WELL ID: Date: 02	JEMW-	4 amer	Time: 1300
Time	Flow Rate (gpm)	DTW (ft. BTOC)	AABCEI	† 6.1 pH	3°1. Temp (°C)	3°1 Cond. (mS/cm)	JIO-U ORP (mV)	10°/- DO (mg/L)	10 / Turbidity (NTU)	Other	Comments
130 9	100mL	27.65	500 ml	7.55	28.90	5.34	104	136	193	-	<u> </u>
1304	Inf	政争站	1000mL	755	2922	5.84	103	0.73	75.5		
1320		27.65	1500ml	7.54	24.44	5.34	100	0.44	29.1		
1388					29.61		96	1.07	19.0		switched to 451 for
1333						5.34	92	0.91	9.2		
1338					29.54		88	0.87	7.8		
1343		27.65	3500	7.54	24.64	5.33	90	0.85	6.7		
1348	1	2745	4000	7.57	29.50	6.34	29	0.85	5.7		
1353		27.65	4500	7.53	2056	6.32	90	0.86	57		
1358	/	27.65	5000	7.67	29.61	5.32	88	0.85			
										_	
									_		
										7	
										\rightarrow	
							-	-			\
									-+	-	-\
					-	-+					\
_						-					
						\longrightarrow					
						-					
							$-\!$		1		
		-		+					\longrightarrow	$- \downarrow$	
. COMME	NTS										
. Coming		_									

Signature Myrardaj for e



GROUNDWATER PURGE AND SAMPLING FIELD DATA SHEET

1. PROJ	ECT INFORM	IATION				- JAIVII	LING F		322 - 257	MEET		
	t Number: 🎦		ATack Num	V.	-1	WELL ID: <u>UFMW - 06T</u> Date: 8-72-16 Time: \(\) \(\) \(\) \(\) \(\)						
Client	_NERT	-	DI 92K MUIII	ber:	<u> </u>					Time: 0645		
Projec	t Location:	Head	Dellan	NV					YC, D	. Keady		
		TICALD		144			weather:	Sunny	100-	F. Windy		
	DATA Diameter:	K 7										
	ze:					Type of Ca		ve				
	Depth of Well		-'' ^{''} 39.8	a	6	Type of Screen: PVC						
	to Static Wai		27 40	<u>U</u>	_ ft. _ ft.	Screen Length: 31.88 to 31.88 ft bgs Calculated Casing Vol.: gal						
	to Product (E				_ rt. _ ft.	Calculated	Casing Vol.:			gal		
4	of Water Co				_n. ft.	Purne Vol. (Calculation (o	na carina val	-0041843	et.		
3. PURG	E DATA											
1	Method:		Low	1 Flow			1		NT MODELS			
	ials: umb / E	Baller		SAMPL			- 1. 2.	YSE S				
1	ials: Tubina/			POLYBUN		BING	- 2. 3.	Soling				
Pumpi	ng Rate:		100)		mt/min	4.	MP				
Was w	ell purged dr	y?	YES	(ND)		•	5.					
		Cum.	±0.	3%	3%	=10	10%	10%	10%			
Time	DTW	Water	рН	Temp	Cond.	ORP	DO	Turbidity	Other			
	(ft. BTOC)	Removed (mL)	"	(°C)	(mS/cm)	(mV)	(mg/L)	(NTU)	YSEDO	Comments		
0755	27.67		7,44	27.05	5.42	154	1.23	6.3				
0800	27.62	500	7.46	26.89	5.42	148	0.61	5.7	_			
0805	77,62	1000	7.51	26.82	5.43	140	0.42	5.2		Hool Day		
0810	27.60	1500	7.49	26,82	5.43	136	0.41	4.6	1.03	Hariba Do broken		
0815	CHAN		ORIBA		ERIES;		N HOL		1103	15I Do started		
0820	27.10	2000	7:57	27.18	5,44	126	~~	5.1	127	DTW: 27.60		
0825	27.60		7.53	27:01	5,43	126		3.3	0.77	Dive : chigo		
0830	27.60	3000	7.52	74.87		124		-	_			
0835	27.60	3500	7.52	26.84				2.1	0,73			
	27.60	4000	7.52			123			0.72			
0840	21.00	7000	7132	26.84	5,43	121		2.3	0.67	STARLE		
	 											
					2	2587	2-16					
	I											
4. SAMPL	ING DATA									-		
Method			Samo	as alo	1 .		[Anal	*	Method		
Materia	ls: Pump / Ba	iler .	4/1/1	4	<u> </u>			=	VOCs	82608		
	ls: Tubing / R			IF.				H	SVOCs Metals	8270		
	Time of Sam	-	27.6	0					TPH	60108 / 7000 Series 80158		
Sample	ID: 🕻	JANW-DE	5-201608		55	_	!		SEE COC	,		
Duplicat	te Sample ID:	N/	Α		Field Filtere	()	, мо					
	ENIZE					FOR	reschland	<u> </u>				
. COMM	FIN12											
		_/										
lote: 2-inch well:	= 0.167 gal/fi		4-inch well =	0.667 gal/f	t	-3- 17		7)				
				-				1/11				



GROUNDWATER PURGE AND SAMPLING FIELD DATA SHEET

1. PRO	JECT INFORM	IATION						UPMW					
	ect Number: 1		Hask Numl	nor: KC	ol .		WELL ID:	11411W	0617	Time: 0930			
Clier	t: NER	T	ask Halling	-	_	Personnel: E-PCICO, D. Keady							
	ect Location: _		ek(biA	VIA		Weather: Suny, loof, who							
		III	CAGOTT	1 44			weatner:	3 phing	100 F	, wway			
	L DATA	2						010		-			
	ng Diameter:		_ in.			Type of Ca		PVC					
	Size: D. C		_in.			Type of Screen: PVC							
	Depth of Well	,,-	49.9		_ft.	Screen Length: 944.1 to 949.9 ft bgs							
•	h to Static Wal	, , ,			_ft.	Calculated	Casing Vol.			gal			
	h to Product (E	-		E.	_ft.								
Leng	th of Water Co	lumn (h): _	22.3	<u> </u>	ft.	Purge Vol. (Calculation (a	ne casing val.	= 0.041*d ²	*h)			
3. PUR	GE DATA							EQUIPMEN	IT MODELS				
Purg	e Method;		LOW	Flow			1.	_ Hori	ea U	52			
Mate	erials: (ump) E	Bailer	()E	D Same	ne the	VY Pro	2.	45					
Mate	erials: (ubing)/	Rope	Poly	Bonded	1/4"-	tuleika	3.		st 104				
Pum	ping Rate:			100		mL/min	4.	MP					
Was	well purged dr	у?	YES	(10)		V	5.						
		Cum.	JO.1	3%	37.	生日	10%	10%	10%				
Time	DTW	Water	pH	Temp	Cond.	ORP	DO	Turbidity	Other	Comments			
_	(ft. BTOC)	Removed	"	(°C)	(mS/cm)	(mV)	(mg/L)	(NTU)	AZE DO	Comments			
i Dia	27.01	(mt)	-7 ->	-01-	210	01117	Horita	1		<u> </u>			
1010	27.91	0	7,77	29.62	6.65	144	6.06	11.2	3,32				
1015	27,9)	<i>50</i> 0	7.78	29.52	6.60	141	3.92	87	2.87	Horiba DO Still undi			
1020	27.92	1000	7.79	29.28	6.60	139	2.58	5.5	2.77	relying on 455 DO			
1025	27.92	1500	7.78	29.20	6.62	138	-	4.3		1049 -1 10- 0-			
	27.93		7.18						7.58				
1030		2000		29.30	6.62	136		6.0	240				
1035	27.93	2500	7,78	2937	661	35		4.4	237				
1040	27.94	3000	7.78	29.47	6.60	135		5.2	2.45				
1045	127,91	3500	7.79	29,58	6.59	133	_	5.3	2.48				
1050	27.95	4000	7.78	29.67	6.6	134							
1030	47715	INCO	T-795	ZUGT	10.0	137	, ·	5.2	2,46	STABLE			
			-		13.								
						AX	· 1/2	- 10					
						UP I	3	, ,					
. SAM	PLING DATA		0					Ana	lyte	Method			
Meth	od(s):		Same	as al	PVE				VOCs	8260B			
	rials: Pump / B) 7					SVOCs	8270			
Mate	rials: Tubing / I	Rope		•			_		Metals	6010B / 7000 Series			
DTW	at Time of Sarr		270						TPH	8015B			
•	le ID:	UFMW-C	16D-70K	0822 11	160			X	SEEC	OC			
Direction	cate Sample ID	: p//4			Field Filtere		NO						
Dupii						FOY P	esch loss	k					
	MENTS												
	MENTS												
	MENTS												

Water Levels UFIW-085 27.98 8/9 08 I 28.28 8/9 8/9 08 D 28.11 8/10 075 24.00 UFIW D7 I 25.43 8/10 07 D 28.26 UFIW 065 27.59 815 24.92 060 27.55 8/3 28.28 UFIW 055 818 28.13 05I 05 D 28:18 UFMW-27.75 D4D E1-1 27.55 8/11 E1-2 27.40 E1-3 27.71

27,05

E2-2

NERT-Soil Flushing IRM DTW Readings

2/26/16

Start 0848 Finish

Well	OTW (bToc)	- 18 18113
E1-1		
UFAW-OIS	27.96	W. 200
OII	27.94	
01 D	28.04	
4Fmw-025	27.75	
OZI	27.84	
E1-2		
E1-3	27.61	
4 Fmw-035	Dry (25.85) 27.31	
YEIW-015	79 X-XFENCE	- X Gate
OII	27.76 TN 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	27.33 27.23 23.31	,
	27.48 27.16 27.58	8
UFIW - 075 2 041 3	17.63	

E2-1 26,93 E2-2 27.02 E2 3 27.32 E2-4 27.41 E2-5 27.40 4FMW-045 27.75 04I 27.80 040 27.73 4Fmw- 055 27.40 05 I 27-71 05 D 27.81 4Fmw-065 27.59 06I 27.52 06 17 27.57 UFIW-05> 4.27,99 05I 28.13 050 28.16 UFIW-065 28.18 06I 28,16 06 D Z8.39 4FIW-075 28.14 07 I 28,09 070 28.22 4PIW-08 28.01 08I Z8.02 0817 28.15 DFW-03 31.63 -04 32.41 -65 32.29

-06 35,41

	Solling	toekkile	estime:	Mega	vel/ken	16/1/68	(0) 4111
Project Name:	NERT Ta	isk K01 - Soil Flus	hing IRM	And the second of the second of the second		THE RESERVE OF THE PARTY SHAPE	Autorities of the property of the contract of
Address:	510 S. 4th Street	Henderson NV 80	THE RESIDENCE AND ADDRESS OF THE PARTY OF TH			Date:	1/23/17
Technician:	Jarob Son	17.04					ate Access Code: 6
Weather: 40	OF						
acceptance of the second	Programme consequences and consequences and an experience of the consequences of the c	an menangkalan enganjakan menangkalan kanangkalan berangkalan berangkalan saka sakalah berangkalan saka sakala Berangkalan kanan saka sakan berangkalan sakan berangkalan berangkalan sakan sakan berangkalan sakan berangkal		The state of the s	and the second s	en man management allerte des en en en en en en en en en en en en en	
Well ID	Depth to Water (ft btoc)	Total Depth of Well (ft btoc)		N	otes (well condi	tion, etc.)	
Injection Wells			PLOT 1 (N	NORTH)			
UFIW-01S	24.25		1010				
UFIW-011	26,47		2007				
UFIW-01D	26.86		2008				
UFIW-02S	25,48		2012				
UFIW-021	25.52		2013				
UFIW-02D UFIW-03S	25.75		2014				
UFIW-031	25,25		2014 2016 2017				
UFIW-03D	25.22		2017				
UFIW-04S	25.45		2019				
UFIW-041	25,34		2022				
UFIW-04D	25,34 25,59		2024				
Monitoring Wa	ells						
UFMW-01S UFMW-01I	27.68		11940				
UFMW-01D	1		1942				
UFMW-02S	27.33		1944		···	ř.	
UFMW-021	28,26		<u> विपेर्व</u>				
UFMW-02D	28,26 28,39 25,18		1951				
UFMW-03S UFMW-03I	25.78		2001				
UFMW-03D	26.14		2002				
Extraction We		L	2004				
E1-1	35.27		1933				
E1-2	35.96		933				
E1-3	43.66	L	1935	O LIEU			
Injection Well	ls		PLOT 2 (St	OUTH)			
UFIW-05S	1	I	1				
UFIW-05I							
UFIW-05D							
UFIW-06S UFIW-06I							
UFIW-06D							
UFIW-07S		1					
UFIW-071							
UFIW-07D UFIW-08S							
UFIW-081							
US0-WITU							······································
Monitoring W	lells		2621				
UFMW-04S UFMW-041	25.83 25.91		2026 2028				
UFMW-04D	25,86		2029				
UFMW-05S	26.06		2031				
UFMW-05D	1 55,75		2032 2034				
UFMW-06S			2038				
UFMW-061	25,77		2039			······································	
UFMW-06D			2041				
Extraction W E2-1	ens	Г					
E2-2							
E2-3							
E2-4 E2-5				·····			
E2-3		L					



WELL GAUGING DATA

Project Number: 194-87600008

Task Number: KO1

Client: NERT

Project Location: Henderson, NV

Date: 1/25 - 01/26

Personnel: Jest Frakes

Weather: Trung - Virily J2°F - 10°F

T	Well ID	Time	DTW (ft.)	Depth to Well Bottom (ft.)	Well ID	Time	DTW (ft.)	Depth to Well Bottom (ft.)	Notes / Well Conditions:
DINAIA	E1-1	1623	36.71		UFIW-02S	1523	26.68	28	01/25/17
	E1-2	1626	37.84		UFIW-02I	1526	26.58		
	E1-3	1629	44.49		UFIW-02D	1532	26.65		
	UFMW-01S	1615	28.60	29	UFIW-035	1536	26.44	30	
	UFMW-01I	1617	28.92	沈	UFIW-03I	1539	26.35		
	UFMW-01D	1618	29.11		UFIW-03D	1541	26.51		
	UFMW-02S	1609	28.32	29	UFIW-4S	1545	26.65	28	
	UFMW-02I	1610	29.23		UFIW-04I	1548	26.47		
	UFMW-02D	1611	29.37		UFIW-04D	1549	- 26 50		4
	UFMW-03S	1559		25.82	E2-1	0958	25.30		01/26/17
	UFMW-031	1601	27.03		E2-2	1002	25.34		
	UFMW-03D	1603	27.13		E2-3	1005	25.62		
	UFIW-01S	1512	27.44	28.56	E2-4	1007	25.75		
	UFIW-01I	1518	27.55		€2-5	1010	25,07		<u> </u>
4	UFIW-01D	1520	27.58			Ų,			

Signature:

Revised: 08/25/2015
P:\Engineering Reference Files and Proposals\Field Forms

Page of 2



WELL GAUGING DATA

Project Number: 194-87600008

Task Number: KO1

Client: NERT

Project Location: Henderson, NV

Date: 01/25 - 01/26
Personnel: Jaco Londo
Weather: Vany Wing

	Well ID	Time	DTW (ft.)	Depth to Well Bottom (ft.)	Well ID	Time	DTW (ft.)	Depth to Well Bottom (ft.)	Notes / Well Conditions:
CHIEVED	UFMW-04S	1442	26.75	29	UFIW-07S	0932	26.50	31	01/26/17
	UFMW-04I	1443	26.79		UFIW-07I	0.933	26.16		
} [UFMW-04D	1444	26.76		UFIW-07D	0936	26.32		
()	UFMW-05S	1448	26.96	30	UFIW-085	0926	26.48	30	
	UFMW-05I	1448	26.85		UFIW-08I	0930	26.41	_	
	UFMW-05D	1449	26.72		UFIW-08D	0840	26.15		.9
	UFMW-06S	1452	26.67	30					
	UFMW-06I	1453	26.59						
7	UFMW-06D	1455	26.61						
U1/25/A	UFIW-05S	0951	26.21	29.5	~				
	UFIW-05t	0949	26.43						
\ [UFIW-05D	0953	25.98						
	UFIW-065	0944	26.45	32					
	UFIW-06I	8942	26.53				_		
之	UFIW-06D	0946	26.60						

Signature:

Revised: 08/25/2015

P:\Engineering Reference Files and Proposals\Field Forms



	ECT INFORM t Number: 19		Task Numb	er: <u>K01</u>			WELL ID: U	/		Time: _/2/3
Client:	NERT						Personnel:	Jesse	Bunk	265
	t Location: He	nders, NV					weather: _	COIO.	(1801	
Casing Slot Si Total I Depth Depth	DATA Diameter: ze: ? · U Depth of Well to Static Wat to Product (B n of Water Col	(BTOC): er (BTOC): _ TOC):	in. 2\$,2 27.4	IN .	ft. ft. ft.	Type of Scr Screen Len Calculated	gth: 2.3 Casing Vol.:	V= U.3:	<u>स्र</u> स्र	ft bgs gal
3. PURG	E DATA		1 .	: ,				EQUIPMEN	TMODELS	6
•	Method:		bai	121			1. 2.	110-	-IAN N.	
	ials: Pump / 6 ials: Tubing /	Secret 1					- ^{2,} 3,			
	ing Rate:		-		·	mL/min	4.			
	vell purged dr	y?	YES	W			5.			
Time	DTW (ft. BTOC)	Cum. Water Removed (mL)	pН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
1213	77.49	1 you	7.48	12.85	4.31	-83	7.63	0.0		>1000 NTU vample
	-	-					2			
	-							<u> </u>		:
	+					5	JL			
			_				d1-26-17			
				ļ						
	 	-		-						
	 						-			
. SAM	PLING DATA				<u> </u>		.1	i Ana	alyte	Method
Meth	od(s):			100	above			į 📙	VOCs	8260B
	rials: Pump / I							į H	SVOCs	8270
	rials: Tubing /	*						:	Metals	6010B / 7000 Series
	at Time of Sai		27.		-		_		TPH	8015B
*	ile ID: cate Sample ii		-	-	Field Filte	red: YES	i (NO)		-	ier Ca
i. COM	IMENTS	Dje	dien	ıl .	-			!		
late: 2-inch we	ell = 0.167 gal	/ft	4-inch wel	l = 0.667 ga	l/ft			7		\rightarrow
		-				Signature		/		
								/		



1.	Project Client: Project	Location: <u>He</u>	<u>4-87600008</u>	Task Numb	oer: <u>KO1</u>			WELL ID: { Date: _t/ Personnel: Weather: _	151W-0 26/17 Vess cold,	e Bunk Ulear	Time:
2.	Slot Siz Total D Depth t	DATA Diameter: ee:(j · U epth of Well to Static Wat to Product (B of Water Col	(BTOC): er (BTOC): _ TOC):	in. 28.4 26.4		_ft. _ft. _ft.	Type of Scre Screen Leng Calculated (th: 22 Casing Vol.:	to 0.319	28 P 14 gal	ft bgs gal hJ
3.	Purge f Materi Materi Pumpii	E DATA Method: als: Pump / B als: Tubing / ng Rate: ell purged dr	Rope	ba YES	le (mL/min	1. 2. 3. 4. 5.		T MODELS	
	Time	DTW (ft. BTOC)	Cum. Water Removed (mL)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
	1250	26.15	7 yet	7.06	12.94	4.23	-42	JL 0:-2(-1)	767		
5.	Metho Materi DTW a Sampli Duplic	ials: Pump / li ials: Tubing / it Time of Sar	Bailer Rope mpling:	26 725-20	.15 170126	Field Filter	ed: VES) NO	Ana	VOCs SVOCs Metals TPH	Method 82608 8270 60108 / 7000 Series 80158
Note	2-inch we	il = 0.167 gal,	/ft	4-inch we	ll = 0.667 ga	I/ft	Signature:				



	20015	T INFORM	ATION						150 1 N	> c	
•		T INFORM		Tack No1	20e. PO4			WELL ID:	1514-8	<i>)</i>)	Time: 1304
	Client: f	Number: <u>19</u>	→-010UUU0	rask NUMIC	1611 VOT			Date: 1/	6-2-		rime: <u>7) (7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</u>
	_	<u>vent</u> Location: <u>He</u>	andree MV					Personner:	10/0/	- Jan	V-e/5
			Hinelatina		- <u>-</u>			weather:	Co Toi,	(186.7	
	WELL C		7						pro		
	Casing I	Diameter:	10:	ln.			Type of Ca	ising:	Δ7.U		
	Slot Size	Diameter: e:(/ .	(7700)	in. 29.4	ži.		Type of Sc	reen:	1 *	7.1	
	Total De	epth of Well	(BTOC):	26.4	řū	_ft.	Screen Ler	ngth:	_ to	<u> </u>	ft bgs
	Depth t	o Static Wat	er (B1OC): _		ts.	_III.	Calculated	reen: 2-5 I Casing Vol.: 2 N V	-1.11	- 13	gal
	Depth t	o Product (B of Water Col	(100);	.? +2	<u> </u>	ιπ. ft.	#	4 N V	- 1.62 6	المرز م	
	Length	or water co	iumn (n):	_ 0		_π.	Purge vol. (Calculation (or			'h)
	PURGE			1					EQUIPMEN	MODELS	()
	Purge N	- 1	2)	Post	21			_ 1.	TLCV	to n-	3 L
		ls: Pump / B	~©~C 1		_			2.			
		ls: Tubing 🛴	Rope		-			_ 3.			
	Pumpin	-			1		mL/min	4,			
	was we	ll purged dn	y? 	YES	(N)			5.			
TI	ime	DTW (ft. BTOC)	Cum. Water Removed (mL)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
130)4	26.49	2 yui	6.98	12.83	4.51	-70	7.13	416		anne
		5011	-			7.07	.0	1.13	710		
_			-		-						
											<u> </u>
		_									i i
					1						
					<u> </u>		-		_		
					ļ			ゴレ			
								V1-26-17			
					1						
					+			1			<u> </u>
					-	-	•	 			
					/						
								 			
					 (-			
						·					
					<u>. </u>						
		ING DATA			re .	above			Ana	lyte	Method
	Method				Sec				! !!!	VOCs	8260B
		ls: Pump / B			*				: 닏	SVOCs	8270
		ls: Tubing / I	•	1/4 11	P %				: ∐	Metals	6010B / 7000 Series
		Time of San	npling: WF1W-0	26,4	- 1	-		Λ		TPH	8015B
	Sample	ID: te Sample ID			14 0146	dialateric.			N N	1270	
	nabilcai	e sample IU			-	Field Filter	ea: YES	NO	; <u> </u>	Hez	UM.
	сомм	ENTŞ	Dy s	desen	₩.V				<u> </u>		
			U								
	tank - 21	0.163 11	160	4.1	0.000	11.	7111	0.000			
	inch Well:	= 0.167 gal/	IT	4-inch well	= 0.667 gal,	/T				-	The same of the sa
e: Z-		01201 941/7	,-				Signature:	-	~	7	



-					3				1001.1.6	1. 6	
1.		T INFORM			1100			WELL ID:	FIW-0	45	- 1777 //
	-	Number: <u>19</u>	4-87600008	Task Numb	er: <u>KU1</u>			Date: 1/	ZG/17	2	Time: 1328
	Client: N							Personnel:	cold.	e Dun	Time: <u>1328</u> kers
	Project	Location: <u>He</u>	ngers, NV					vveatner: _	COLO,	(1267	
2.	WELL D								N I/O		
	Casing D	Diameter:					Type of Ca	_	374		
	Slot Size	0.0	10	in.			Type of Sci	reen:		5 C	
	Total De	pth of Well	(BTOC):	28,10)	ft.	Screen Len	gth: 23 Casing Vol.:	to	2	ft bgs
	Depth to	o Static Wate	er (BTOC): _ :	46,72		ft.	Calculated	Casing Vol.:	0.22	22	gal
	Depth to	Product (B	TOC):	170						_	
	Length o	of Water Col	lumn (h):	(-34		ft.	Purge Vol. C	alculation (on	e casing vol.	= 0.041 *d * *	'h)
3.	PURGE	DATA			_				EQUIPMEN	T MODELS	,
	Purge M	lethod: /	\sim	ba,	lel			1.		Honker	N-25
	Materia	ls: Pump / 🛭	ailer					2.			
	Materia	ls: Tubing /(Rope					3.			
	Pumpln	g Rate:					mL/mln	4.			
	Was we	ll purged dry	y?	YES	(vo)			5.			
Tin	ne	DTW (ft. BTOC)	Cum. Water Removed	ρН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
		(11.5102)	(mL)		(-,	(1115) (1111)	()	(87-1	(1010)		
132	.8	26.72	I zal	7.12	12.80	5.47	- 14	8.03	79.2		erun pho
	c							 -			
					-						
							L				
					 						
								ゴ レ			
								01-26-17			
								-			
							7				
					 			-			
					ļ,						
4.	SAMPL	NG DATA				1 .			Ana	lyte	Method
	Method	(s):			Tec	Drouble .				VOCs	8260B
	Materia	ls: Pump / B	ailer		-					SVOCs	8270
	Materia	ls: Tubing / I	Rope		-					Metals	60108 / 7000 Series
	DTW at	Time of Sam		25.72					! 🖵	TPH	8015B
	Sample		nflw - 0	45- 2013	71176		\cap	1	<u>X</u>	Con	V
	Duplicat	e Sample ID);		-	Field Filter	ed: YES	NO	\boxtimes	Hea	- Cn
_			A	44		-			!		
5.	COMM	ENTS	March :	1 V 0	ye of	ser~cor					
Nate: 7 1	nch wall	= 0.167 gal/	'fe	A lock well	= 0.667 gal,	/64				-	
MOTE: S-II	nen wen	- v.107 gul/,)t	⇔nich well	- v.oo7 gai,	'Ji	Signature:		7	/	
							0				7
									-		
									-		



Project î Client: <u>N</u>	T INFORMAT Number: 194- IERT Location: <u>Hen</u>	<u>87600008</u> T	ask Number	: <u>KO1</u>		Da Pe	ELL ID: hte: ersonnel: eather:		whole	75°F
Slot Size Total De Depth to Depth t	pata Diameter: P. V LU epth of Well (I o Static Wate o Product (BT of Water Colu	BTOC):i r (BTOC):		f	t. S t. G	ype of Casing ype of Scree creen Length Jaiculated Ca Purge Vol. Calc	n: 2 4 , 5 ising Vol.: _ Tuestion (one	casing vol. =	24 0.041*d2*	ft bgs gal I I
Materia Materia	DATA Method: als: Pump / Ba als: Tubing / F			bail		mL/min	1. 2. 3. 4.	EQUIPMENT Its no ba	MODELS N -52	
Was w	ell purged dry DTW (ft. BTOC)	Cum. Water Removed	YES (Temp (°C)	Cond. (mS/cm)	ORP (mV)	5. DO (mg/L)	Turbidity (NTU)	Other	Comments
09W 01Z3		22ul								Ford - 3 WV Liel
1250	26.20	2.25 y	(,72	16.28	4.75	_ (4)	1.51	724		
12.51	46.20	4								Sumers.
										>
				_		5				
		-				J1 01-23-4		-		
		-								
Met Mat Mat OTV Sam	MPLING DATA hod(s): erials: Pump / erials: Tubing V at Time of S uple ID: blicate Sample	Bailer / Rope ampling: 4 F1 W ==	2(0)	,20	E word) по	Ar D	VOCs SVOC Metal TPH	s 8270 ls 6010B / 7000 Series 8015B
5. COI	MMENTS	Pink	Alma							
Note: 2-inch	well = 0.167 g	al/ft	4-inch w	ell = 0.667 g	gal/ft	Signatur	e:		7	

evised 12/22/15

Engineering Reference Files and Proposals\Fleld Forms

Pg 1 of 1





DE	OIECT INCORE	4471011	-							
	OJECT INFORM							MFIV-		0 *
	oject Number: <u>1</u>	94-87 <u>6</u> 0000	전 Task Nun	nber: <u>K01</u>			Date: <u>2 }</u>	Jan 7	7	Time: 0435
	ent: <u>NERT</u>						Personnel	<u></u>	Luyade	
Pro	oject Location: <u>H</u>	enders, NV					Weather:	JUNARY	- Wind	y 35°F
. WI	ELL DATA	2								u
Cas	sing Diameter: _		_in.			Type of C	asing:	PV-		
Slo	t Size:	Vo	_in.			Type of So	reen:	fru		
	tal Depth of Wel		ें।, केंद्रे		ft.	Screen Le	neth: 2.4	to	37	ft bgs
De	pth to Static Wa	ter (BTOC):	20,41		ft.	Calculated	1 Casing Vol	J. 59	2	gal
De	pth to Product (i	BTOC):	_		ft.		3445	7 1	_	Bai
	ngth of Water Co		5.4	2	ft.	Purge Vol.	reen: ngth: <u>2 チ</u> d Casing Vol. マレルこ Calculation (o.	ne casina vai	= 0.041*42	*61
	RGE DATA							-		""
				Luci	ι			EQUIPMEN	NT MODELS	
	rge Method:			ا الملما			_ 1.	Homb	4 W-3	
	iterials: Pump/ (_ 2.			
	terials: Tubing	Rope					_ 3.			
	mping Rate:	_		_		_mL/min	4.			
wa	s well purged dr	γ? 	YES	(10°)			5.			
Time	DTW (ft. BTOC)	Cum. Water Removed (mL)	pH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
0526										b
1000		3 4 1			+					En Sur bul
	aC 2.0	3 9-1	_							EM RMA Pul
1315	26.34				+					Augh
10	8	2,2yal	7.14	15.38	4.20	-177	6.11	flood		CC .
							-	111		
				-		<u> </u>				
				 						
				┿						
200										
							āL			
				-			0.1-27-17			
				-			V.1-47-17			
	- 1									
				<u> </u>						
				 			 			
										<u></u>
	/IPLING DATA			_				Anal	lyte	Method
	hod(s):				ee du	<u> </u>	i		VOCs	8260B
Mat	erials: Pump / B				~				SVOCs	8270
	erials: Tubing / I			1.1	-				Metals	6010B / 7000 Series
	5 - 4 TH C		26		_				TPH	8015B
DTW	at Time of Sam	IFIN - U	5-2017	91 <u>7</u> 3		(i)	į		few!	
DTW Sam	ple ID:			_	Field Filtere	ed: YES	NO		Heir	Cn
DTW Sam							i	_		
DTW Sam Dupl	ple ID: licate Sample ID									
DTW Sam Dupl	ple ID: licate Sample ID		41-14							
DTW Sam Dupl	ple ID: licate Sample ID		11111							
DTW Sam Dupl	ple ID: licate Sample ID		1111							
DTW Sam Dupl	ple ID: licate Sample ID	Tmk .		= 0.667 gal,						



1.	Projec	CT INFORI t Number: 1		Q Tael Noe				WELL ID:	MEIW-	240	
		r womber: 1	194-8/00000								
		NERT		ō i ask i i i i t	nber: <u>KQ1</u>				Jun F	<u>r</u>	Time: 1015
1			lenders, NV					Personnel	:J. L	سامة بدول	C Huz
<u> </u>			reliders, 144					Weather:	Garany.	وبالود والمناح	73°F
2.	Slot Si Total C Depth Depth	Diameter: ze:	U			_ ft. _ ft. _ ft. _ ft.	Calculated	reen: 		_	ft bgs gal
3.		E DATA				_1t.	Purge Vol. (alculation (o	ne casing vol.		
١,		Method:			Best				EQUIPMEN	IT MODELS	£5
	_	als: Pump /	Bailer					- 1. 2.	11.04	IVA W-	<u>,,, , , , , , , , , , , , , , , , , , </u>
		als: Tubing ,						_ 2. 3.			
		ng Rate:					mL/min	4.			
l	Was w	ell purged d	ry?	YES	NO		•	5.			
	Time	DTW (ft. BTOC	Cum. Water Removed (mL)	рH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
_	11										Boyn Sul
(0)	40		3 CHL		-						EN SUN BA
(3	40	26.53	3.2	7.11	16.31	5.47	-155	1. 19	270		*
				-		3,7 /	-63		240		romple
├											
<u> </u>					-						
						l i					
								고			
					 		> ~	1-27-17			
					 	-		1-54-14			
					 						
									1		
		<u></u> _									
4.	SAMPI	ING DATA									
	Method				dee	Dun		!	Anal		Method
	Materia	is: Pump / B	ailer						H	VOCs SVOCs	8260B 8270
		ls: Tubing /			-	•				Metals	8270 6010B / 7000 Se
		Time of San		ec.5}				-	\Box	TPH	80158
	Sample Duplicat	ID: e Sample ID	4Flu- d	7J - EU(£0127	ciala en	. (多 :		* U
	- spireat	- somple to			-	Field Filtere	a: YES	NO	<u> </u>	Mei	(Vr
5.	сомм	ENTS	Pink	Fluid							
				- 1940/							· · · · · ·
ilata: 5	took 2	0.465									
	-men well =	0.167 gal/j	rr 4	i-inch well	= 0.667 gal/j	t			-	-	
wote. 2							ignature:				

Revised 12/22/15



. PI	ROJECT INFOR	MATION					200	(- Pi) 4= 0	27	
	oject Number:		R Task Nur	nhar: KO1			WELL ID:	WFIW-0	84	fact e
	ent: <u>NERT</u>		<u></u> 103K 1401	noer. <u>Kot</u>			Date: 4	J. L	- ده سافه	Time: 105 5
	oject Location:	Henders NV					Personnei	J (Justo	2018
		HEHIOE13, 144					Weather:	- Mark	- rwill	78 .
	ELL DATA	-								
	sing Dlameter:					Type of C	asing:	the		
SId	t Size:	<u> 10</u>	_in.			Type of So	creen:	10 C		
To	tal Depth of W	ell (BTOC):	30,0	71	ft.	Screen Le	ngth: 2 5	to	30	ft bgs
De	pth to Static W	ater (BTOC):	26.9	54	ft.		d Casing Vol.			gal
De	pth to Static W pth to Product ngth of Water ((BTOC):			ft.		3 MM = 1			9
Le	ngth of Water (iolumn (h): _	3,47	•	ft.	Purge Vol.	Calculation (o		= 0.041°d²	*h)
PL	RGE DATA									<u> </u>
	rge Method:			Rul				EQUIPMEN	IT MODELS	C 3
	iterials: Pump/	Daile		- 11			- 1.	Lion	טאָ טי	32
	iterials: Fulling						_ 2.			
	mping Rate:	L-Galle					_ 3.			
	is well purged o	l=.a	YES	(N)		_mL/min	4.			
44.	- wen hruken (•	162	עעעי			5.			
Time	DTW (ft. BTO	Cum. Water Removed (mL)	рН	Temp (°C)	Cond. (m5/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
U 55										Para O I
1115		274			 	-	-			Bayon Day
	- C //	474								End I'M And
1400	26.50	2.15 9		+	-		+		_	Juny 4.
		V	C.73	16.99	6.28	-100	3.04	Zov		70
			-	+	0720		3.5 (200		
				+						
							ĺ			
_	İ									
		 					7			
	_			-						
							ゴレ			
							01-27-17			
				 			01-24-11			
						7				
	- 1									
				 	1		-			
	151115									
	/PLING DATA				' al .		i	Anal	yte	Method
	hod(s):			370	ا مان		i		VOCs	8260B
	erials: Pump / I				-				SVOCs	8270
	erials: Tubing /								Metals	60108 / 7000 Series
	at Time of Sar	npling:	26.	SU					TPH	8015B
		WFIV-0	25 - 20	170126) i	位	tend	`
	licate Sample I(): <u> </u>		_	Field Filter	ed: (YES	NO		Hex	
							i		,	
Dup		A La	Fluid							
Dup	MENTS	Pink	11.4121							
Dup	MMENTS	Pink	10000							
Dup	MENTS	Pink								
CON	MMENTS vell = 0.167 gal/			= 0.667 gal/						



1.	Proje Clien	UECT INFOR ect Number: ht: NERT	194-876000		nber: <u>KQ1</u>			WELL ID Date: _/	: UFMV 126/17 el: Je	-015 1656 Ru	Time: 1/28
2.	WEL	L DATA						Weathe	cald,	clear	
	Slot S Total Depti Depti Lengt	g Diameter: iize: Depth of We to Static Wa to Product (h of Water Co	II (BTOC):	_in. _24.3			Type of So Screen Le Calculated	ا کیا کے ا کہا کے	Pro to to 7 = 9 , 3 ione casing vo	193 wal	- - ft bgs gal -
3.	Purge Mater	iE DATA Method: ials: Pump (ials: Tubing (Bail			1. 2.	EQUIPME	NT MODEL	<u> </u>
	Pumpi	ing Rate: rell purged di		YES	(Ng)		mL/min	_ 3. 4. 5.			
	Time	DTW (ft. BTOC)	(mL)	pH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
	128	28.60	0.590	5.97	16.59	3.77	1.208	6.94	370		Sunju
_											
									ļ ———		
									 		
								\rightarrow			
_									JL		
_									V1-21-17		
_									V 1 - D (- 1)		
_											
_											
						7					
	2222										
	Method(s Materials Materials DTW at Ti Sample ID	: Pump / Bail : Tubing / Ro Ime of Sampl	pe —	28.60	-		<u>(a)</u>		Analy	VOCs SVOCs Metals TPH	Method 82608 8270 60108 / 7000 Series 80158
	COMME		o dre			ield Filtered	VES	NO	<u> </u>	He	
: 2-ii	nch well = ().167 gal/ft	4-i	nch well = 0	.667 gal/ft	-				~	
						Sig	nature:		1	15	5
2/22	2/15									1	



1. PROJ	ECT INFORM	AATION	-			-				
	t Number: 1		0.71 M	1 1100			WELL ID:	15MW-0	25	Time: <u>//5/3</u>
	NERT	34-0 /00000	g rask Nun	iber: KO1			Date: _/_/	26/17		Time: 1/53
	t Location: <u>H</u>	landare NIV					Personnel	<u> </u>	- Bunks	156
		ienders, igy					Weather:	Calot,	Clear	
	DATA	2								
Casing	Diameter:		_in.			Type of C	asing:	LAC		
Slot Si	ze: 🔻 🗸 🗸	10	_in.	i a		Type of So	reen:	TVU		
Total C	ze: V V Depth of Wel to Static Wa to Product (I (BTOC):	• 1	17	_ft.	Screen Le	ngth: Z-Y I Casing Vol.: SW V	to	49	ft bgs
Depth	to Static Wa	ter (BTOC): ,		- 2-4	_ft.	Calculated	Casing Vol.:	0.1:0	4	gal
					_11.					
Length	of Water Co	olumn (h):	1 * 0		_ft.	Purge Vol.	Calculation (o	ne casing vol.	= 0.041 *d 2	*h)
3. PURG	E DATA							EQUIPMEN	T MODELS	
Purge (Method:	\sim 1	_ ba.	lec			1.	He	ما سماء	1.52
Materi	als: Pump / E	Bailer)					2.			
Materi	als: Tubing /	Rope					3.			
Pumple	ng Rate:					mL/min	4.			
Was w	ell purged dr	γγ	YES	(NO)		-	5.			
		Cum.		-						
Time	DTW (ft. BTOC)	Water Removed (mL)	рH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
1153	28.37	1- 0 gal	7.34	16.38	2.73	147	7.80	249		Jungle .
						• 7 /	1.00	677		300/10
							-			
	 									
				1						
	-									<u></u>
	1 1									
						/	プレ			
					/					
							01-26-17	1		
				1 1						
· · · · · · · · · · · · · · · · · · ·						>				
			-							
		Т								
. SAMPL	ING DATA				1		- !	Amel	<u></u>	00-41-4
Method	(s):			sec i	ablove		!	Anai	•	Method
Materia	ls: Pump / Ba	ailer -		-					VOCs	8260B
	ls: Tubing / R	_						H	5VOCs	8270
	Time of Sam		2.5.	17				H	Metals	6010B / 7000 Series
Sample I		AFMW-U	21-201	70126			, i	$\overline{}$	TPH Peri	80158
Duplicat	e Sample (D:				Field Filtere	d: YES	NO	- ☆ -	1963	14
					_			مر _	1108	CIL
. сомм	ENTS	Co dy	2							
						-				
ote: 2-inch well =	: 0.167 gal/ft	4	inch well	= 0.667 gal/f					1	
					S	ignature:		/		->
									<	
							-			



	ECT INFORM ct Number: 1		9 Tack Num	shor: KO1			WELL ID:	MEMU-	ans:	
	: NERT	34-0700000	O TROK HUIT	iber. <u>KOT</u>			Date: 27	Jan 17	F	Time: 1130
	ct Location: <u>H</u>	enders, NV					Weather:	JANAY.	- Will	V 32°F
	DATA g Diameter: _	2	in			T 10	_	PVC		No 10
Slot S	lze:	110	_ ''* _ in,				ising:	AUC		
Total	Depth of Wel	(BTOC):	24.	J-0	_ft.	Type of Sc			7.1	
	to Static Wa				_ ft.	Calculated	ngth: 2 4 Casing Vol.:	J. 19	1	ft bgs
	to Product (6		_		ft.		311/2	1.107 (4.1	gal
Lengt	h of Water Co	lumn (h): _	2.25		_ft.	Purge Vol. (Calculation (o			*h)
. PURG	E DATA			p .				EQUIPMEN	NT MODELS	
_	Method:	7		Buil			1.	Ho	-, by U	-5 L
	ials: Pump / E						2.			
	tals: Tubing /	(Ope					3.			
-	ing Rate:	_				mL/min	4.			
vvas v	vell purged dr		YES	NO			5.			
Time	OTW (ft. BTOC)	Cum. Water Removed (mL)	рH	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
(130										Begins Bull
1145		1.5gul								End 2WV buil
1420	2660	7-75c,	7.53	8.49	5.71	-10	3.34	140		donal
			, ,					- (3		and the
	1									
	-									
_										
						7				
				-		/				
	 			-	- 1		47			
	+			 	- 9	>				
	 						01-27-17			
	<u> </u>									
	<u> </u>									
	LING DATA			z			i	Anal	yte	Method
Metho		-		Jev	Alow		i		VOCs	8260B
	als: Pump / Ba	-							SVOCs	8270
	als: Tubing / R			-					Metals	6010B / 7000 Series
	Time of Sam		14 6 9 9 9	10.00					TPH	8015B
Sample Dunlica	ID: te Sample ID:	ENW. J	107 - TO1	アクロスチ	Winds en	. (0)		<u>×</u> -	Low	
очриса	re semble (h:	#6 . M > 6	945~ LO	IDILY	rield Filtere	d: (YES)	NO	_ الحا	Hox 1	· r
COMN	ENTS	No due	U							
te: 2-inch well	= 0 167 anl /4		1 inah	0.00	-					
.c. a-men wen	- 0.107 gai/Jt	4	+-ıncn well	= 0.667 gal/j		ignature:			-	
					3	ingliacure:				1
								//		
12/22/15							6			



	NFORMATI	ON					こころチ ゴム	120-wr	110	ne: <u> [] {</u>	5		
PROJECT I	mber: <u>194-87</u>	7600 <u>008</u> Tas	k Number:	<u>KQ1</u>		_	anadt	T Laws	س	931F	l		
Client: NEf	λτ Στ					W	eather: 🗘	MAY -W	waly	93"			
Project Lo	cation: <u>Hendi</u>	ers, NV									-		
WELL DA					T	a of Casini	. P	V U					
Casing Dia	meter:	2in			Type of Casing: Type of Screen:								
Slot Size:	0.011) in	24. i.c	64	Type of Screen: ft. Screen Length: ft. Calculated Casing Vol.: 70 30 ft bgs gai gai								
Total Dep	th of Well (B	TOC}:	20.96		Ca		elea Vol 1	12	B	41	1		
Depth to	Static Water	(BTOC):	-	f				casing val. = 0	.041°d²*h)		1		
Depth to	Product (BTC f Water Colu	mo (h):	3.14	f	t. Pu	rge Vol. Cal	culation (one	QUIPMENT	MODELS				
	_							QUIPMENT	KIODELS	Z			
PURGE				Buil			1 2	(30.7.7.					
Purge M	etnou: ls: Pump / Ba	ile					2 3.						
Materia	ls: Tubing / R	op				nL/min	4.						
Pumpin	g Rate:	•		ng		, and the second	5.						
Was we	ii purged dry	?	YES						Other				
		Cum. Water		Temp	Cond.	ORP	DO (1)	Turbidity (NTU)	Other	}	comments		
Time	Ift. BTOC)		pН	(°C)	(mS/cm)	(mV)	(mg/L)	(1112)			0		
	(10.0100)	(mL)		-						+010	2 Bull		
(15)											3WV Bul		
205	1	2 april		10.16	i cat	35	1.11	545	_	Simpl	<u>ـــــــ</u>		
1440	27.00	2,154	7.8	1635	८न(T			
14 10	-	+		+			-						
				Τ	1			 	-	+			
		-	-					 	1	+			
			+	+		Τ							
					1								
					-		্ৰ ব						
					-	1	01-2	9-16					
						/	_		\				
					///////			_	1				
	_		_\ 			-1) -		-					
		_				X	_		-				
										_			
				_							Method		
					,C			-	Analyte VO	Cs	8260B		
	MPLING DA	NIA.		Sec	ماءمه			는	SVC)Cs	8270		
M	ethod(s): aterials: Pum	n / Bailer						一; 三] Mei	als	6010B / 7000 Serie		
M	aterials: Tubi	ng / Rope] TP	A 1	8015B		
D'	TW at Time o	f Sampling:	2	1.99	16		\bigcirc		}	Paper Hex Co			
Si	ample ID:	ufm	W-027	L	Field F	iltered:	YES N	10	J	Lion o			
□	uplicate Sam	pie IU:											
ļ	OMMENTS	No	die										
5. (Olaliateta 13	1-0	0										
) -	7		
		-1/6	A.Int	h well = 0.6	67 gal/ft	W 2000	-		-	10	1-		
	a = 0.16	s / ani/it	-4-111F	er er er er er er er er		Clari	ature: 🧾			-	100		
Note: 2-in	CU MAII - 0.32	,, 9,,				2,6,,	1010101	-::		-			



L. PROJ						200000	1.1			1
Pa t	ECT INFORM						WELL ID:	4FMW-	080	
	t Number: 1	<u>94-8760000</u>	명 Task Num	nber: <u>K01</u>			Time: 12:15			
Client:							Personne	್ತ ರ. ಒ	15116	
Project	t Location: <u>H</u>	lenders, NV					Weather:	3708		
WELL	DATA									
Casing	Diameter: _ re: U	2	_ in.			Type of C	acine:	PVC		
Slot Sla	re:	L	in.			Tune of S	sauriR:			
Total D	te:V.Vepth of Wellto Static Wa	(BTOC):	_ 30.3.	Ž.	ft.	Type of Casing: PVC Type of Screen: PVC Screen Length: QS to			30	
Depth	to Static Wa	ter (BTOC):	26.67		ft.	Calculate	Casing Vol.	to		ft bgs
Depth	to Product (I	втос):	_		ft.	Carculatet		= 1.745		gal
Length	to Product (I of Water Co	lumn (h): _	3.65		ft.	Purae Vol	Calculation (o			
	DATA					- trige voi.	-urcolation (o			
	Method:			AI				EQUIPMEN	NT MODELS	5 .
_	als: Pump (E	anilla.		Puil			_ 1.	Hu	ribu W.	- 5 1_
	als: Tubing						_ 2.			
Pumpin		КОРЕ		-			3.			
•	ell purged dr		vee			mL/min	4.			
	por Bea ar	Αi	YES	N9			5.			
Time	DTW (ft. BTOC)	Cum. Water Removed (mL)	рН	Temp (°C)	Cond. (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Other	Comments
1215										A. D.
1230		2 G1L								Login Buil
500	26.71	2,136	7160	\$6.35	~		<i>C</i>			End 3 WV bus
,- 0	66.71	LIDA	1-16	44.25	5.32	-25	6-32	348		ans je
					1 1					
					 					
		- 1								
						-)				
						/	-			
							31			
			[4		01-27-1			
								+		
						/				
	- 1		(_ [- 1	
					/	Τ:				
					- CI	1	- 1	į.		
SAMPLI	NG DATA									
SAMPLII Method(s				Toc.	Jour.			Analy		Method
Method(s		iler		Joe	Jove			Analy	VOCs	8260B
Method(s Materials	s):			Soc	Jone			Analy	VOCs SVOCs	8260B 8270
Method(s Materials Materials	i): : Pump / Bai	ре	21.7		Jone			Analy	VOCs SVOCs Metals	8260B 8270 6010B / 7000 Series
Method(s Materials Materials DTW at Ti Sample ID	s): :: Pump / Bai :: Tubing / Ro ime of Samp o: \	ope _ ling: _	26.7	-	Jone				VOCs SVOCs Metals TPH	8260B 8270
Method(s Materials Materials DTW at Ti Sample ID	s): : Pump / Bai : Tubing / Ro ime of Samp	ope _ ling: _		127	Field Filtered	1: (6)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B
Method(s Materials Materials DTW at Ti Sample ID Duplicate	s): : Pump / Bai : Tubing / Ro ime of Samp b: : Sample IO:	ope lling: FMW- 0(127		1: (6)	NO	Analy	VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series
Method(s Materials Materials DTW at Ti Sample ID	s): : Pump / Bai : Tubing / Ro ime of Samp b: : Sample IO:	ope ling: FMW- 0(0 F103 - 20	127		ı: (ES)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B
Method(s Materials Materials DTW at Ti Sample ID Duplicate	s): : Pump / Bai : Tubing / Ro ime of Samp b: : Sample IO:	ope lling: FMW- 0(0 F103 - 20	127		d: (ES)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B
Method(s Materials Materials DTW at Ti Sample ID Duplicate	s): : Pump / Bai : Tubing / Ro ime of Samp b: : Sample IO:	ope ling: FMW- 0(0 F103 - 20	127		d: (ES)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B
Method(s Materials Materials DTW at Ti Sample ID Duplicate	s): :: Pump / Bai :: Tubing / Ro ime of Samp 0: Sample ID:	ope Iling: FMW- 0(1	9127	Field Filtered	ı: (ES)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B
Method(s Materials Materials DTW at Ti Sample ID Duplicate	s): :: Pump / Bai :: Tubing / Ro ime of Samp 0: Sample ID:	ope lling: FMW-0(0 F103 - 20	9127	Field Filtered	d: (ES)	NO		VOCs SVOCs Metals TPH	8260B 8270 6010B / 7000 Series 8015B

Project Name:	NEOT TO	sk K01 - Soil Flus	hina IRM	Date: 4/10/17
				Gate Access Code: 69
	510 S. 4th Street, I	Henderson, IVV 03	010	
Weather:	Jacob So 67° F Swr	oza		
Veather.	67°F Swir	Y	CONTRACTOR OF THE PARTY OF THE	
		Total Depth of		
Well ID	Depth to Water	Well		Notes (well condition, etc.)
	(ft btoc)	(ft btoc)		
	·		PLOT 1 (N	ORTH)
Injection Wells				
UFIW-01S	26.78		0955	
UFIW-01I UFIW-01D	27.00		0957	
UFIW-028	27.38		0957	
UFIW-021	26.15		000	
UFIW-02D	26.30		1002	
UFIW-03S	25,93		1003	
UFIW-031	25.97		1005	
UFIW-03D UFIW-04S	26.35		100%	
UFIW-041	26.29		1000	
UFIW-04D	26.20		1011	
Monitoring We	ells		1914	
UFMW-01S	28.6		0928	
UFMW-01I	28.54		0929	
UFMW-01D	28.72		0930	
UFMW-02S UFMW-021	27.79		0432	
UFMW-02D	28.65		0933 0934	
UFMW-03S	DRV		0936	
UFMW-03!	26.50		6935	
UFMW-03D	26.79		0938	
Extraction We E1-1			601	
E1-2	36,3		9160	
E1-3	43:67		0919	
			PLOT 2 (SC	HITH)
Injection Well	s			3111
UFIW-058 UFIW-05I				
UFIW-05D	+			
UFIW-06S				
UFIW-061				
UFIW-06D UFIW-07S	-			
UFIW-071	+			
UFIW-07D				
UFIW-08S				
UFIW-08I UFIW-08D				
Monitoring W	/elle			
UFMW-04S			ПОЭП	
UFMW-041	26,71		1034 1035	
UFMW-04D			1036	
UFMW-05S			1038	
UFMW-05D	26.67		1039	
UFMW-06S	26.69		1040	
UFMW-061			1042	
UFMW-06D Extraction W	ella CO.54		7044	
E2-1	25.89	1	1/23	
E2-2	26010		1023 1025	
E2-3	26.40 26.57 26.89		1027	
E2-4	36.89	—	1079	
E2-5	- WIDT	1	1031	

JWV

GROUNDWATER SAMPLING LOG

Page _ of _

يت				(Pu	ırge Volu	ıme Meti	10d)		N	ERT, Henders	son, Nevac	
Task Name	: Ar Am	a Treatable	liby the	y		Task Manag	er: A. Ayy	نه مرن	Well ID: OF FIN- 025			
Field Samp	lers: J. Ly	yde		7		Task No.:	- 0		Date: 14 A			
II (A) Bartine	Mail pellson				PURGI	NG DATA				THE BOOK THE	Secretary.	
MP Distanc	e AGS (ft):		Well Depth (f	t BGS): 👅		Well Depth (ft BMP) 2&	25	Nominal Wel	l Pipe Size (in):	ス	
	tion: To C		PID/FID Rea	dings Benea	th Inner Cap (_I	parts per millio	n above know	vn backgroun	d): —			
Screen Top	:(ft	BGS) =	(ft BMP)	Screen Bott	om: (f	t BGS) =	(ft BMP)	Well Riser C	apacity* (gal/f	t): —		
Depth to Wa	ater Before Pu	ımp Installatio	n (ft BMP): 2 (60	Time: 112	5		ubing Type:				
			- Depth to Wa	iter) x Well C	apacity = 0	29 + U.29 Pump Intake Depth (ft BMP)						
Equipment	Decon Method	d: 3 Rimre	,		Groundwate	r Disposal:	GW-	1 ton	1			
Time Start (hrs)	Measure- ment Time (hrs)	Volume Purged (gal)	Cumul. Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond.	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Redox Poten. ORP (mV)	
(120	1145	~ 7.0	~ 1.0									
1500	•					4.94	72.44	4.88	199	10.96	-80	
1										1		
\perp												
-					1				1			
									(1)			
	1							W/				
								y				
	1	/								-		
Well Capa	city (Gal/ft) for	PVC Sch 40	Nominal Pipe S	Sizes: 0.75"			= 0.103; 2" =	= 0.171; 4" =	0.652; 6" = 1	.484, 12 = 5.	766	
Compline M	ethod/e\:		13.		SAMPLI	NG DATA						
Sampling Macon		Y N	Clata Fina	alı V	Al	Sampling Init			Sampling End			
Field Decon			Field Filtere		N	QA Duplicate		N /	COG Time:			
Matena: Sample ID		=40 mi glass v V-015-3	ial; AG=Ambe	r Glass; CG: Duplicate l		PE=polyethyle	ne; O=Other	(Specify) QA/QC Sar	COC Number	-	- 107 E	
S	ample Contai	ner Specificati	on					(color, odor,	sand & silt c	ontent, factors		
No.	Material Code	Volume	Preserv. Used		tended Analys and/or Method		appartus,	etc.)		t, wellhead, sai	npling	
A	Ann	Same	11/2	Set			Su	Hode:	over	lon		
111	7 00	0.00.4		Der				0	AL			
				180	2000		Signature	(s):	40			

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

MP - Measuring Point NTU - Nephelometric Units

Task Nam	e: Af A.	eu Treatu	hilitie 14	(F)	urye vol	ume Met	nod)			Page NERT, Hende	
Field Sam	plers: す. し	ande.	eiting dis	-ay		Task Mana	ger: A 4	Well ID: UFJW - 01			
	and COLOR	7-0				Task NO.;	143 ·	Date: 12 Apr 17			
MP Distan	ce AGS (ft):	_	Well Depth ((# PCC)	PURG	ING DATA		A TOTAL STREET			
	ption; To		PID/FID Pos	ill BGS): -	11.1	Well Depth	(ft BMP) 3	8.8	Nominal We	ell Pipe Size (in)):
			/# PMD	adings Benea	ath Inner Cap	(parts per mill	ion above k	nown backgro			
Depth to W	ater Before P	ump Installatio	n (ft BMD). 2	C 3-a	tom:((ft BGS) =	(ft BMF) Well Riser	und): - Capacity* (gal	/ft): -	_
1 Well Volu	ime (gal) = (T	olal Well Denti	Donit to M	6,77	Time: 08	25	Pump and Tubing Type: But less 5.9.1 Pump intake Depth (ft BMP)				
Equipment	Decon Metho	d: 3 Rive	i - Dehii (O W	ater) x well (Capacity = [19-5.97	Pump inta	ke Depth (ft B	MP) -		_
	Measure	- 16/1.2			Groundwate	er Disposal;	hw-1:	1 Purch			_
Time Start (hrs)	ment Time (hrs)	Volume Purged (gal)	Cumul, Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond. (µ8/cm)	Turbidity	Dissolved Oxygen	
1040	_	~ (. v	~ (. 0						(11103)	(mg/L)	_
1040	1040	~0.25	mc.23		26.50	5.93	21,25	9.13	52-3	2.65	_
									36-3	2.0)	_
								+			
					 			+			
					 						
											_
											-
											-
											_
							\supset	TE			_
								4-1217			_
								7-1245	<u> </u>		
					\rightarrow						
					/						_
							_				_
											_
Mell Consid	10 100 4										_
vveii Capacii	y (Gal/ft) for f	PVC Sch 40 No	minal Pipe Siz	zes: 0.75° =	0.026; 1" = (0.043: 1.5" =	0.103: 2" =	0.171: 4" -	0.000004	484; 12" = 5.76	_
					SAMPLIN	GDATA		0.171, 4 =	$0.002; b^{-} = 1.4$	184; 12" = 5.76	i6
	nod(s): Swy	× _				Sampling Initial	od (bes). El	1642			
eld Decontai		N	Field Filtered:	(F) N	1	A Dunk			Sampling Ende	d (hrs):	
Material C	odes: VOA=4	0 ml glass vial	: AG=Amber G	lass. CG-C	loor Class DC	A Duplicate:			COC Time: ~		
ample ID	MFTW-UZ	KI - 2017	-U411 D	inlicate ID	iear Glass; PE	=polyethylene	e; O=Other (Specify) (COC Number:		_
San	nple Containe	r Specification	, - D(-hurare ID				QA/QC Sam	ples/ID -		_
	Material					Remarks: (color, odor, sand & silt content, factors poss affectring samples; condition of vault, wellhead, sampling at a popular at a					

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

Signature(s):

	1t				(Pi	urge Vol		PLING L	-00			e <u> </u>	
455	Task Name:	AP Area	a Treat	ability of	tud +				Date of the	> Mall ID.	NERT, Hende	rson, Ne	
	Field Sampl	ers: D, K	Pady				Task No.:	M13	CHARAGE	Well ID: UFEW - 025 Dale: 4-/2-17			
	MD Cistoner	100 (6)				PURG	ING DATA			77217			
	MP Distance	ion: TOC		Well Depth			Well Dept	h (ft BMP) Z	8.31	Nominal We	ell Pipe Size (in	1. 7.	
		(ft &		PID/FID Rea	adings Benea	ith Inner Cap	loaris per mi	Illon ahove ka	own backere			<u>, </u>	
	Depth to Wa	ler Reform Du	ma lactallati	(ft BMP) m (fl BMP):	Screen Bolt	tom;(ft BGS) = _	(ft BMP	Well Riser	Capacity* (gal	ft):		
	3 Well Volum	ne (gai) = (To		n (II awr): h - Depth to W				Pump and	Tubing Type:	Bail			
	Equipment C	econ Method	2	brutet	aler) x Well (Capacity =	1.17	Pump Intak	a Depth (ft Bl	IP)			
		Measure-		Cumul.	nnse	Groundwate	er Disposal:	GW-11 M	brul	inclus	W	-	
	Time Start (hrs)	ment Time (hrs)	Volume Purged (gal)	Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units	Temp	Specific Cond. (p S/c m)	Turbidity (NTUs)	Dissolved Oxygen	Red Pote OR	
v	0730		-1.17	1-1.17		26.05			(100,011)	(1105)	(mg/L)	(m)	
3-i	1020	IUZU	V 0,25	~1.42	_	26.05	6.10	21.93	7.04	14.5	150		
	-							71.17	7.01	142	() کما	-15	
								<u> </u>					
								\rightarrow					
													
		and the same of th											
								-					
)									JL (3)				
							-/		4-11-17				
- 1					i								
				-									
- 1-													
-													
-	Well Canacity	(Galift) for Pi	VC Sch 40 M	ominal Dia - C'									
ŀ	· · · · · · · · · · · · · · · · · · ·	(Cast) for r	VC 3C1 40 N	ominal Pipe Si	zes: 0.75" =	0.026; 1° = (0.043; 1.5°	= 0.103; 2" =	0.171; 4° = (652; 6" = 1.	184; 12° = 5.7	66	
	ampling Metho					SAMPLIN	G DATA						
F	ield Decontam	ingligg: V		Cald Ch			ampling Initi		įs	Sampling Ende	d (hrs):		
-				Field Fillered:	Y N	l c	A Duplicate:	YN		OC Time:	·/r		
S	ample ID '	TTW-07	mi giass via	l; AG=Amber (3lass; CG=CI	lear Glass; PE	=polyethyle	ne; O=Other (S	Secretary in				
F		1127 ~	Specification	(וג טו	uplicate ID:	MFIW-U	25-2017	LUHIZ-FDO	AVQC Sami	oles/ID -			
1-	1	Material	operation	Presery.			- 1	Remarks: (color, odor, s	and & silt con	lent, factors po	ossibily	
	No.		Volume	Presery,	inter	nded Analysis		anectring sa	mihisa, colidi	tion of vault, s	vellhead, sam	plang	

and/or Method

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

<u>Volume</u>

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

Used

min - Minute mq/L - m lligram/Liter mV - milli Volts

appartus, etc.)

Signature(s):

+ DUT

MP - Measuring Point NTU - Nephelometric Units

Sultide: overflow

Ŧŧ	TETRA TECH
30	

Sumple

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

	Pag	e <u>1</u>	of	4
ı				

Task Name	3: AP AN	ea Treat	abilita.	trad .	90 1010				y (y)	VERT, Hende	rson, Neva
Field Samp	olers: J. L	agrile	101119	The state of the s		Task No.:	ger: A. Ayy	4V(U M)		u FJw - +2 1	
					DIEC	ING DATA	लाब्द		Date: 12	Apr 17	
MP Distanc	ce AGS (ft): -		Well Depth	(ft BGS):			(ft BMP) 4 1	The.			
MP Descrip	otion: Tu c	0.000	PID/FID Re	adinos Benea	ath Inner Cap (narie nos milli	on about her	was bar 1	15	ell Pipe Size (in)	: ス
Screen Top	o:(ft	BGS) =	(ft BMP)	Screen Bot	tom:(# RCS) =	/A DAKE	own backgrou	nd): —		<u> </u>
I - C PUI I V I I	DICH DOME I	unno mistanano	NI 133 EWIEL 1	L 42	Ti C.O.	and the second s	1_			ft): —	
1 Well Volu	me (gal) = (To	tal Well Depti	h - Depth to V	/ater) x Well (Capacity = 2	(2-1-) to	Pump and Tubing Type: Rayler Pump Intake Depth (ft BMP)				
Equipment	Decon Metho	d: 3 Ringe			Groundwate	er Disposal: (rump intak	SOVAN (II RV	IP) —		
925	Measure		Cumul.		T .	1	11				
Time Start	ment	Volume	Volume	Purge	Depth to	1		(Au/cn) Specific		Dissolved	Redox
(hrs)	Time (hrs)	Purged	Purged	Rate	Water	pH	Temp	Cond.	Turbidity	Oxygen	Poten. ORP
7110	1945	(gal) ~ 8 , ♂	(gal)	(gpm)	(ft BMP)	(pH Units)	(°C)	(µ6/cm)	(NTUs)	(mg/L)	(mV)
1120			~f.0								
1170	(120	20,25	N8.25	~	25.93	5.84	22.81	11.3	61.2	2.12	-30
					 	-/-					
							JL				
							4-12-12				
_											
					/						
Well Capaci	ty (Gal/ft) for I	PVC Sch 40 N	lominal Pipe S	Sizes: 0,75" =	0.026: 1" = 1	0.043 1.5" -	0.102: 2" =	0.474. 40. 4	3.055	484; 12" = 5.7	
					SAMPLIA	NG DATA	0.100, 2 =	U.171; 4° ± (0.652; 6° = 1.	484; 12" = 5.7	66
ampling Met	hod(s): ይሁነ	1				Sampling Initia	stant (ben). I l	1-1 (
eld Deconta	mination: (Y	N	Field Filtere	d: (Y)					Sampling Ende	ed (hrs): —	
Material C	Codes: VOA=	40 ml glass vi			Clear Glass; Pl	QA Duplicate:	Y (N	-	COC Time: -		
ample ID 4	1FIW-UZ	1 - 2017	0412 1	Duplicate ID). -	==polyetnyler			OC Number:		
		er Specificatio		papiloute II	,, <u>, , , , , , , , , , , , , , , , , ,</u>		Parada (QA/QC Sam	ples/ID		
	Material	poomodilo	Presery.	Inte	ended Analysis		affectring s	(COlor, odor, s amples: cond	and & silt cor	ntent, factors p wellhead, sam	ossibly
No.	Code	Volume	Used		nd/or Method		appartus, e	tc.)	mon or vault,	welinead, sam	pling
							۲.	2.1.	overflu.	,	
A P	^	٢	C 1				4.0	I FINO ,	V + OI=1 101	~	
/1	Prea	good by	y J 4								
-		•	9							_	
									A		
							Signature(s):	77		
S - Relow G	Sound Surface	0 0	OC Chair	£ C				-			

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

1		TECH	GF			R SAMP Ime Meti		OG		_	1 of
Task Name: Field Sampl		a treat Keady	al 127	Thely		Task Manag Task No.:	er. Arul F M/3	Maineri	Well ID:	VERT, Hender VFIW-03 12-17	son, Nev
Screen Top: Depth to Wa 3 Well Volum	ion: (ft B (ft B ter Before Pur ne (gal) = (Total	GS) = np Installation al Well Depth	(ft BMP)	Screen Botto	th Inner Cap (orn:(Time:(capacity =	parts per milli t BGS) =	(ft BMP) Pump and T Pump Intake	wn backgroun Well Riser C ubing Type: Depth (ft BM	Nominal We add): capacity* (gal/l	II Pipe Size (in):	2
Time Start (hrs)	Measure- ment Time (hrs)	Volume Purged (gal)	Cumul. Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond.	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Redox Poten ORP
0750	1055	~2.13	N2.13		25.95	5.71	21.68		467	8.94	(mV)
						1261		-17			
							4-10	, , , ,			

Well Capacity (Gal/ft) for PVC Sch 40 Nominal Pipe Sizes: 0.75" = 0.026; 1" = 0.043; 1.5" = 0.103; 2" = 0.171; 4" = 0.652; 6" = 1.484; 12" = 5.766

SAMPLING DATA Sampling Method(s): Balco Sampling Initiated (hrs): Sampling Ended (hrs): Field Decontamination: Field Filtered: Ν QA Duplicate: COC Time: Material Codes: VOA-40 ml glass vial; AG=Amber Glass; CG=Clear Glass; PE=polyethylene; O=Other (Specify) COC Number:

and/or Method

Sample ID VFIW-035-20170412 Duplicate ID: QA/QC Samples/ID Sample Container Specification Material Preserv. Intended Analysis

Remarks: (color, odor, sand & silt content, factors possibly affectring samples; condition of vault, wellhead, sampling appartus, etc.)

Sulfide: overflow

BGS - Below Ground Surface

Code

Volume

No.

BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

Used

min - Minute mg/L - milligram/Liter mV - milli Volts

Signature(s):

MP - Measuring Point NTU - Nephelometric Units

TETRATECH

GROUNDWATER SAMPLING LOG

				(Pu	rge Volu	ıme Metf	nod)		N		of <u></u>
Task Name	AP Area	Theata	しませい	stral				Lucius.	Well ID: I	ERT, Hender	son, Neva
Field Samp	lers: D	eady	7	7		Task No.:	<u> </u>	TH Y Y LINE	Date: L	12-17	SL_
		- 4			PURGI	NG DATA	Ville III.		- andi	12-17	
MP Distance		_	Welf Depth	(ft BGS):		Well Depth (ft BMP) 4	0.09	Nominal Wel	l Pipe Size (in):	. 2 _
	tion: +O		PID/FID Rea	adings Benea	th Inner Cap (parts per millio	n above kno	wn backgroun	d):		
Screen Top	(ft B	(GS) =	(ft BMP)	Screen Botte	om:(f	t BGS) =	(ft BMP)	Well Riser C	apacity* (gal/f	t):	
Depth to wa	ater Before Pu	mp Installatio	n (ft BMP):	26.12	Time:		Pump and T	ubing Type:	Railer	,	
Well Volu	me (gal) = (Tot	al Well Depth	- Depth to W	/ater) x Well C	apacity =	1.56	Pump Intake	Depth (ft BM	P)		
Equipment I	Decon Method	3 bc		mse	Groundwate	r Disposal:	GW-11				
Time Start (hrs)	Measure- ment Time (hrs)	Volume Purged (gal)	Cumul. Volume Purged (gal)	Purge Rate (gpm)		pH (pH Units)	Temp (°C)	Specific Cond. (uS/cm)	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Redox Poten. ORP (mV)
0950		~7.56	-7.56		26.12						
	1210					6.07	29.07	7.14	52.2	8.43	-58
				-							
<u> </u>				 							
		_					1				
	-						12	1			
						+ U	10				
		_				DY,					
				-	- (7					
ļ	-										

well Capac	ity (Gal/it) for f	PVC Sch 40 N	Iominal Pipe	Sizes: 0.75° :	0.026; 1" =	0.043; 1.5" =	= 0.103; 2" =	0.171; 4" =	0.652; 6" = 1	.484; 12" = 5.1	766
Camalia - 14-	the all all D		la maria		-	NG DATA					•
Sampling Me		ailer				Sampling Initia	ated (hrs):	210	Sampling End	ed (hrs): (2-	30
Field Deconta		N I	Field Filtere			QA Duplicate:		-	COC Time:	1210	
Sample ID	Codes: VOA=	10 mi glass vi	al, AG=Ambe	Glass, CG=	Clear Glass; F	E=polyethyler	ne; O=Other	(Specify)	COC Number.	1.	
				Duplicate II):			QA/QC Sam			
38	Imple Containe Material	er Specification	Preserv.	Int	ended Analys		Remarks;	(color, odor,	sand & silt co	ntent, factors ; wellhead, san	possibly
No.	Code	Volume	Used		ind/or Method		appartus, e	etc.)			npiing
AP	Area	. 75	Jamp	ny s	e+.		SV	14th :	e over	rflow	
000 5	Ground Surface			211			Signature(s):	21/		

 Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

MP - Measuring Point NTU - Nephelometric Units

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page ____ of ____

Task Name	e: Ar An	ea Treat	bildy S	hrdy		Task Manac	or A-	Λ	I MAIL ID.	LKI, Hender	son, Neva
Field Sam	plers: D	ceady	1	1		Task No.:	40.12	My was	Vveil ID:	VFIW-0	45
	2272				PURG	ING DATA	M3		Date: 4.	12-17	
	ce AGS (ft):	/	Well Depth (i	ft BGS):			(ft BMP) 28	77-	Maminal Ma	II Dina Dina III-A	
MP Descri	ption:	C	PID/FID Rea	dings Benea	th Inner Cap (narts ner millir	on above know	un hackeen	-N.	Il Pipe Size (in):	
Screen Top	p: (ft	BGS) =	(ft BMP)	Screen Bott	iom:(ft BGS) =	(ff RMP)	Mall Ricar C	a);	Ns.	
Debut to 44	rater belore to	muh wierswatto	m (ICBMP): 🔪	26,33	Time:		Pump and To			1):	
3 Well Volu	ıme (gal) = (To	otal Well Depth	n - Depth to Wa	ater) x Well C		1.08		Depth (ft BM	Barter		
Equipment	Decon Metho	d: 3 buck	et nha				S-W-//		P)		
	Measure	-	Cumul.				-W - //	T UT J AR			
Time Start	ment	Volume	Volume	Purge	Depth to			Specific		Dissolved	Redox Poten.
(hrs)	Time (hrs)	Purged (gal)	Purged	Rate	Water	pH	Temp	Cond.	Turbidity	Oxygen	ORP
	(110)		(gal)	(gpm)	(ft BMP)	(pH Units)	(°C)	%S/cm)	(NTUs)	(mg/L)	(mV)
0812	1/25	N1.08	~1.08								
	114	_	-			5,98	22.79	4.22	136	9.78	-89
									<u> </u>	-	-01
t-											
							(3)				
						-	7;\1				
						4.1					
	-			\longrightarrow	A DY	- \					
		 				0					
			_/		V						
	<u> </u>										
						+					
Well Capac	tity (Gal/ft) for	PVC Sch 40 N	Inminal Pine S	izee: 0.75" -	0.000, 45 =	2.042: 4.69	3 132 31				
· ·	., , ,		IOTHINOT I IDE C	1263, 0.70	: U.UZD; =	0.043; 1.5° =	0.103; 2" =	0.171; 4° = 0).652; 6" = 1.	.484; 12° = 5.7	66
Sampling Me	ethod(s): Ka	1				NG DATA					
ield Decont		YN	Field Filtered	i. V		Sampling Initia	ited (hrs): []		ampling Ende	ed (hrs): L	15
			Field Fillered	: Y !	N (QA Duplicate:	Y N		OC Time:	125	
Sample ID	COUCS. VUA-	40 mi glass vi	al; AG=Amber	Glass; CG=C	Clear Glass; P	E=polyethylen	le, O=Other (S	Specif y) - C	OC Number:		
		C (C4)-		Ouplicate ID): 			QA/QC Samp	oles/ID		
36		er Specificatio	-	1-1-			Remarks: (color, odor, s	and & silt cor	ntent, factors p	ossibly
No.	Material Code	Volume	Preserv.		ended Analysis	s	affectring sa appartus, et	impies; cond	ition of vault,	wellhead, sam	pling
110.	GOGG	VOIUITIG	Used	d	nd/or Method		-pp	,			
							Cit	de:	2.12	1 /	
- Da	1 01	+1					SOIL	in .	UVETI	0W	
	prog	17 7	amp In	1 54	31				\bigcirc	(
			(1				N	= \	\ /	
			U				Cignobus/s	, —	XX		
20 - 1	81 - 5-						Signature(s));/			

BGS - Below Ground Surface 8MP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

	TŁ	TETR/	ATECH	ı Gl	ROUND	WATER	RSAMP	LING L	OG			C .
				2.50	(Pu	ırge Volu	ıme Meti	hod)			JERT Hendo	of _
	Task Nam			By Stud	4		Task Manag	er: Arul F	tura no se	Well ID:	VETW-	son, Neva
	Field Sam	plers:	Keady		/		· con i io	M/3	440000	Date: 4	12-17	04 E
	MD Distan	an AOD (III)		du un		PURG	NG DATA		-		10-17	
	MP Distan	ce AGS (ft):			(ft BGS):		Well Depth ((ft BMP) 38	2,70	Nominal We	Il Pipe Size (in)	: 7
	-			PID/FID Rea	adings Benea	th Inner Cap (parts per millio	on above kno	wn backgrou	nd):		
	Denth to V	p: (ft l Vater Before Pu	ump loctolleti	(π BMP)	Screen Bott		t BGS) =		Well Riser (Capacity* (gal/	ft):	
	Well Vol	ume (gal) = (To	inh Installand	h Dooth to W	6.59	Time:		Pump and T	ubing Type:	Bailer		
	Equipment	Decon Method	1: 3 C	in - Depuir to w	ater) x vveii C		6.45		Depth (ft BA	(P)		
		Measure	. 0 00	Cumul,	rse	Groundwate	r Disposal:	6W11				
	Time	ment	Volume	Volume	Purge	Depth to			W/Em		0314	Redox
	Start	Time	Purged	Purged	Rate	Water	pH	Temp	Specific Cond.	Turbidity	Dissolved Oxygen	Poten. ORP
344	(hrs)	(hrs)	(gal)	(gal)	(gpm)	(ft BMP)	(pH Units)	(°C)	(pC/cm)	(NTUs)	(mg/L)	(mV)
	1030	17400	16.45	76.45	1	26.39						
JANFLE	12 40	1240	~0.25	~ 6.70		26.34	6-11	21.61	6.62	15.6	€.€3	- 121
	-				ļ							
			 									>
		-										
					ļ							
		ļ										
		-						TL				
		-						4-12-13				
		-										
	<u> </u>											
		-										
	* Malt Cass	-it- (C-100 f)										
	vveii Capac	city (Gal/it) for I	² VC Sch 40 N	Nominal Pipe S	3izes: 0.75" =	0.026; 1" =	0.043; 1.5" =	0.103; 2°=	0.171; 4* =	0.652; 6" = 1	.484; 12" = 5.7	66
4	<u> </u>					SAMPLIN	NG DATA					
	Sampling Me		wer				Sampling Initia	ated (hrs):		Sampling End	ed (hrs):	
		amination: Y		Field Filtered	d: Y	N (QA Duplicate:	- A - 1 4		COC Time;		
	Sample ID	Codes: VOA=	10 ml glass vi	al; AG=Amber	Glass; CG=C	llear Glass; Pl	E=polyethylen	e; O=Other (Specify)	COC Number:	-	
		VFIW - (Juplicate ID	<u> </u>		(QA/QC Sam	ples/ID 🕓		
		ample Containe Material	ar Specificatio	Preserv.	Into	ended Analysis		Remarks: (color, odor,	sand & silt co	ntent, factors p	ossibly
	No.	Code	Volume	Used		nd/or Method		appartus, e	ic.)	JUDEN OF VAUIT,	wellhead, sam	pling
ĺ								· c .				
	Λ	0 0				0.		2~1	tide:	0000	۵. ،	
	H	H	Ca T	5 59.	up like	-set		1.1	erd 4	overy	10W	
					• 0	-						

BGS - Below Ground Surface

BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

MP - Measuring Point
NTU - Nephelometric Units
QA/QC - Quality Assurance/Quality Control

Signature(s):

TETRA TECH

GROUNDWATER SAMPLING LOG

Page 1 of 1

	(P	urge volume iviet		NERT, Henderson, Nevada
Task Name: 41 Area Treate	beliby is troly	Task Manag	ger: And Agyarmi	Well ID: VFIW - 955
Field Samplers: J. Lyuk		Task No.:	413	Date: (v April 47
		PURGING DATA	APSIA COLUMNIA COLUMNIA	
MP Distance AGS (ft): -	Well Depth (ft BGS):	Well Depth	(ft BMP) 29 - 37	Nominal Well Pipe Size (in): 2
MP Description: Tびし	PID/FID Readings Bene	ath Inner Cap (parts per milli	on above known backgrou	and): —
Screen Top: (ft BGS) =	(ft BMP) Screen Bo	ttom: (ft BGS) =	(ft BMP) Well Riser	Capacity* (gal/ft):
Depth to Water Before Pump Installation			Pump and Tubing Type:	Builen
1 Well Volume (gal) = (Total Well Dept	h - Depth to Water) x Well	Capacity = 0.4(+1.3)	Pump Intake Depth (ft B	MP) —
Equipment Decon Method: 3 PW	4000	Groundwater Disposal:	GWI-11 Pand	

Cumul. Measure-(MS/CM) Redox Volume Time ment Volume Purge Depth to Specific Dissolved Poten. Start Purged Time Purged Rate Water pH Temp Cond. **Turbidity** Oxygen ORP (hrs) (hrs) (gal) (gal) (ft BMP) (pH Units) (gpm) (µ8/om) (°C) (NTUs) (mg/L) (mV) 1410 0935 2-901 2-94 26.54 1350 6. 64 5.57 0.87 1350 325 ~2,25 26,70 -173 25.4 JL W-10-17 Well Capacity (Gal/ft) for PVC Sch 40 Nominal Pipe Sizes: 0.75" = 0.026; 1" = 0.043; 1.5" = 0.103; 2" = 0.171; 4" = 0.652; 6" = 1.484; 12" = 5.766

SAMPLING DATA Sampling Method(s): 6,11 Sampling Initiated (hrs): Sampling Ended (hrs): Field Decontamination: Field Filtered: Y QA Duplicate: Y COC Time: Material Codes: VOA=40 ml glass vial; AG=Amber Glass; CG=Clear Glass; PE=polyethylene; O=Other (Specify) COC Number:

Sample ID UFIW-OSS-2012/1. Duplicate ID: QA/QC Samples/ID

Sample Container Specification Material Preserv. Intended Analysis No. Volume Used and/or Method Code

Remarks: (color, odor, sand & silt content, factors possibly affectring samples; condition of vault, wellhead, sampling appartus, etc.)

Signature(s):

BGS - Below Ground Surface

COC - Chain of Custody BMP - Below Measuring Point Cond - Specific Conductivity C - Centigrade GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

MP - Measuring Point NTU - Nephelometric Units

化	TETRATECH

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page 1 of 1

	-			(ru	rge voiu					EHI, Hender		
Task Name:	At tre	a Trest	publility a	Study		Task Manage	er: A. Ayy	Grun.		FW-051		
Field Sampl	ers: J. L	of goll		8	- 794	Task No.: M	12	Date: 10 Apr 17				
direction)	S I I I I I I		TEA PERSON	- 0.00	PURGI	NG DATA	owuri was	Secretary Victor	No. of Control	The state of the s		
MP Distance	e AGS (ft):	_	Well Depth (ft	BGS):		Well Depth (f	t BMP) 39.	25	Nominal Wel	l Pipe Size (in):	4	
	tion: TO C		PID/FID Read			-			i): -	-		
		ags) =	(ft BMP)					T		t): -		
			(N SNN / n (ft BMP): こら					ubing Type:		7		
			- Depth to Wa									
				iei) x vveii c								
Equipment	Decon Method	in the	-	user -	Groundwate	r Disposal:	GW-1	And in case of the latest states			Carley	
Time Start (hrs)	Measure- ment Time (hrs)	Volume Purged (gal)	Cumul. Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond. (µS/crh)	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Redox Poten. ORP (mV)	
1150	1230	~7.0	~7 x)		ļ							
1435	1475	NU.25	~.7.25		26.81	7.18	27.36	4.00	245	1.98	-149	
· · ·								 				
					+							
					-			+				
	-							1				
						ļ					-	
						†		TE	<u> </u>			
		+	1					04-10-19				
			+		1		-	g-(-roop				
	+	-	+		-	(1		ļ		
								-		-		
)						
										į		
	+				-	1					<u> </u>	
						+	1		 	1		
* Well Cana	acity (Gal/ft) fo	or PVC Sch 40	Nominal Pine	Sizes: 0.75	" = 0.026· 1"	= 0.043° 1.5°	= 0.103; 2"	= 0.171: 4" =	0.652: 6° =	1.484; 12" = 5	5.766	
						ING DATA			, -			
Sampling L	lethod(e)				JAMPL	Sampling Ini	tiated (hrs):	-	Sampling Er	nded (hrs):		
Sampling N		V N	Field Filter	ed: Y	N	QA Duplicat		N	COC Time:	(Mor-		
	ntamination:								COC Number	v V3		
			vial; AG=Amb			, r==poiyetnyl	ene; U=UIN6			51.	***************************************	
Sample II			20 176410	Duplicate	19;	de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la	Ramarke	QA/QC Sa		content, facto	s possibly	
	Sample Conta	aner Specifica			Intended Acet	veie		•		ult, wellhead, s		
Ne	Material	Volume	Preserv. Used		Intended Analy and/or Metho		appartus	, etc.)				
No.	Code	Volume	Osed	1	MINION MINION	70.00	1		ř.	~		
					^		-	Sulsa	1 : OV	e-flow		
	DO A	7	Cita	1400	1017	Q	-			1		
	$\prod I$	4	Sam	p vyy	6 1		-		31.22			
							_		1-1	1	-	
							Signatur	re(s):	1			
-		1407 1007		-		- 100	90 10					

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface min - Minute mg/L - milligram/Liter mV - milli Volts

Task Name	· A B A.		P 1 1 2	(PL	ırge Volu	ıme Met	hod)			VERT, Hender		
Field Same	lers: J. L	V1 1100	tability	thudy		Task Manag	ger: A. Ay	a tumi	Well ID: U.FI W - 065			
ricid Odrnp	icis. U. J	MARKE			BUG 3	Task No.:	M 13		Date: 10 Apr 17			
MP Distanc	e AGS (ft): -		Well Depth (f	+ BCS)	PURG	NG DATA	(1) (2) (2)			m Villa Nation		
	tion: TUC		PID/FID Read		th Inner Can /	parte per milli	(ft BMP) 31.	+0	Nominal We	Il Pipe Size (in)	1 2	
Screen Top	: (ft I	3GS) =	(ft BMP)	Screen Bott	om: Thirte Cap (PECCI - 24	On above kno	Wn Dackgrour	nd): —			
Depth to Wa	ater Before Pu	mp Installatio	л (ft BMP): 2 7	.07	Time: 094	1000) = 5		ubing Type.	capacity* (gal/i	t): —		
1 Well Volu	me (gal) = (To	tal Well Depth	ı - Depth to Wa	ter) x Well C	apacity = 0	Pt 4 2 44 2	Pump Intaka	Dooth (# Dt.	ID)			
Equipment l	Decon Method	1:3 Alune	1		Groundwate	r Disposal:	GW-11		117) -			
Time Start (hrs)	Measure- ment Time (hrs)	Volume Purged (gal)	Cumul. Volume Purged (gal)	Purge Rate (gpm)	Depth to Water	pH (pH Units)	Temp	Specific Cond.	Turbidity	Dissolved Oxygen	Redo: Poten ORP	
०५६६	100 5	~2.5	25	(35)	(It DIVIII)	(pri onits)	(°C)	(µS/c m)	(NTUs)	(mg/L)	(mV)	
1480	1450	~0.25	~2.75	_	27.10	6.61	25.17	41.58	41000	2,01	-207	
	-											
-	-											
				-								
)	ゴレ					
		_				/	016-10-13					
					/							
		_										
-												
Mell Canaci	hi /Calfft\ fac f	NO C-1- 40 N					53					
чен Сарас	ty (Gai/it) for i	VC Scri 40 N	iominal Pipe Si	zes: 0.75 =			0.103; 2"=	0.171; 4"=	0.652; 6" = 1.	484; 12° = 5.7	66	
ampling Met	hod/el-				SAMPLIN		- 14	-10		II — PI II		
eld Deconta		N	Total			Sampling Initia	ated (hrs):		Sampling Ende	ed (hrs):	-	
und withfulld	ammanull, T	N	Field Filtered	Y	V	DA Duplicate:	Y N ie; O=Other (COC Time:	1800		

Sample Container Specification

Material Preserv. Intended Analysis
No. Code Volume Used and/or Method

Remarks: (color, odor, sand & silt content, factors possibly affecting samples; condition of vault, wellhead, sampling appartus, etc.)

Sulfide: overflow

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade

3WV

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

Signature(*):

MP - Measuring Point NTU - Nephelometric Units



Jample

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page 1 of 1

NERT Henderson Nevada

		+ 1			ige void	IIIIC IVICUI		-14		EHI, Hender	
Task Name:		i ru ada	bility di	<i>pudy</i>		Task Manage	in A. Ayy	AUG MI		FIW- 06I-	- 12-10-10-10-10-10-10-10-10-10-10-10-10-10-
Field Sampl	ers:					Task No.:			Date: [1 A	pr 17	
Land Control						NG DATA			HILLY O		
	B AGS (ft):	•	Well Depth (ft			Well Depth (f				l Pipe Size (in)	1
<u> </u>	tion: TOC		PID/FID Read								
			(ft BMP)							t): —	
		:	n (ft BMP): 📿 🕻		Time: 022			ubing Type:			
1 Well Volut	me (gal) = (To	al Well Depth	- Depth to Wa	ter) x Well C	apacity = 🚻	4 + 9.42	Pump Intake	e Depth (ft BMI	P) -		
Equipment (Decon Method	3 now	La composition and the		Groundwate	r Disposal: 🕻	W-11	Powl			
	Measure-		Cumul.		Suprem 1	III was a		(MS/CM)			Redox
Time	ment	Volume	Volume	Purge	Depth to			Specific		Dissolved	Poten.
Start	Time	Purged	Purged	Rate	Water	pH	Temp	Cond.	Turbidity	Oxygen	ORP
(hrs)	(hrs)	(gal)	(gal)	(gpm)	(T BMP)	(pH Units)	(°C)	(#8/cm)	(NTUs)	(mg/L)	(mV)
0230	0905	~9.5	~1.5								
1315	1335	10,25	~9.75		26.83	5.61	26.73	8.71	32.4	1.05	-194
215 00	-										
		- 100		14111		19.76		-			
											-
	+	1	1					+			-
								+			
	1	-	-	/							
	1		_				1				
)				
						/		ゴレ			
								4-11-17		1000	
	1							1			
			1			-					
			1					+			
)		-			
	-		-			/		-			
* Well Capa	city (Gal/ft) for	PVC Sch 40	Nominal Pipe	Sizes: 0,75°	= 0.026; 1":	= 0.043; 1.5*	= 0.103; 2"	= 0.171; 4" =	0.652; 6" =	1.484; 12" = 5	.766
<u> </u>	. 31			778 - 121 - 27	SAMPL	ING DATA		gs — 320			
Sampling M	lethod(s):	_		(392)		Sampling Init	iated (hrs):	1372	Sampling En	ided (hrs):	
Field Decor	ntamination: (Y/ N	Field Filtere	ed: 🖤	N	QA Duplicate	: Y	(i)	COC Time:	_	
Materia	I Codes: VOA	=40 ml glass	vial; AG=Ambe	r Glass; CG	=Clear Glass:	PE=polyethyle	ene; O=Othe	r (Specify)	COC Numbe	er:	
	UFIW-			Duplicate	1111111111111111				nples/ID		
	Sample Contai					_ = = =	Remarks			content, factors	s possibly
	Material	Speamou	Preserv.	la la	ntended Analy	rsis	affectring	samples; co		lt, wellhead, s	
No.	Code	Volume	Used	bile service.	and/or Metho		appartus		Ci	. N	
					(4)			Sintful	n We	entlar	
Λ.	Λ	^						-V11113			
	they	Sant	Lay J	1							
	-	,	1						_	12	
		-								5	
TO WOOD ON							Signatur	e(s):		1	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface min - Minute mg/L - milligram/Liter mV - milli Volts

JUV

GROUNDWATER SAMPLING LOG

(Purae Volume Method)

Page	1	of	1
rage	_	OI	-

Task Name: At Arua Tractability Official Task Manager: A. Agrana. Well ID: 470 - 07 Field Samplers: 3. Lagrador Task No.: At 3 Date: 10 April 7 PURGING DATA MP Distance AGS (ft): Well Depth (ft BGS): Well Depth (ft BMP) 30. 88 Nominal Well Pipe Size MP Description: 700 PID/FID Readings Beneath Inner Cap (parts per million above known background): - Screen Top: (ft BGS) = 2585 (ft BMP) Screen Bottom: (ft BGS) = 30.85 (ft BMP) Well Riser Capacity* (gal/ft): - Depth to Water Before Pump Installation (ft BMP): 27.01 Time: 1734 Pump and Tubing Type: Attay 1 Well Volume (gal) = (Total Well Depth - Depth to Water) x Well Capacity = 0.67-12.01 Pump Intake Depth (ft BMP) - Equipment Decon Method: 3.2 Curcu Groundwater Disposal: Good. Turbidity Oxyge (mg/L Time Measure— Purged (gal) (gal) (gpm) (ft BMP) (PH Units) (°C) Dissolve (mg/L) 1 US3 2.25 2.25 2.25 7.34 7.39 30,59 6.12 16,4 7.03/L	
Task No.: A13 PURGING DATA MP Distance AGS (it): MP Description: To C PID/FID Readings Beneath Inner Cap (parts per million above known background): Screen Top: (It BGS) = 368 (It BMP) Screen Bottom: (It BGS) = 368 (It BMP) Depth to Water Before Pump Installation (It BMP): 27.01 Time: If 34 Well Volume (gal) = (Total Well Depth - Depth to Water) x Well Capacity = 0.67-12.01 Pump and Tubing Type: Pump Intake Depth (It BMP) Equipment Decon Method: 3.3 Curcus Groundwater Disposal: Measure- Time Measure- Time Measure- Time Purged Purged Purged Rate (gal) (ga	(in): 7
MP Distance AGS (it): Well Depth (it BGS): Well Depth (it BMP) 3c. 88 Nominal Well Pipe Size MP Description: PID/FID Readings Beneath Inner Cap (parts per million above known background): Screen Top: (it BGS) = 2686 (it BMP) Screen Bottom: (it BMP) Screen Bottom: (it BGS) = 3686 (it BMP) Well Riser Capacity* (gal/it): Depth to Water Before Pump Installation (it BMP): 27.01 Time: 1634 Pump and Tubing Type: 404 Pump Intake Depth (it BMP) Equipment Decon Method: 3.2 (2002) Groundwater Disposal: Well Depth to Water Disposal: Well Biser Capacity* (gal/it): Pump and Tubing Type: 404 Pump Intake Depth (it BMP) Forundwater Disposal: Well Biser Capacity* (gal/it): Pump Intake Depth (it BMP) Dissolve Cond. Turbidity Oxyge (hrs) (hrs) (gal) (gal) (gal) (gal) (gpm) (it BMP) (pH Units) (°C) NTUs) Nominal Well Pipe Size Nominal Wel	(in): 7
MP Description: Tot PID/FID Readings Beneath Inner Cap (parts per million above known background): — Screen Top: (ft BGS) = ZSSS (ft BMP)	(in): 7
MP Description: 70 C PID/FID Readings Beneath Inner Cap (parts per million above known background): — Screen Top: (ft BGS) = 2555 (ft BMP) Screen Bottom: (ft BGS) = 30.75 (ft BMP) Well Riser Capacity* (gal/ft): — Depth to Water Before Pump Installation (ft BMP): 27.01 Time: 1/34 Pump and Tubing Type: 4/4 1 Well Volume (gal) = (Total Well Depth - Depth to Water) x Well Capacity = 0.67-12.01 Pump Intake Depth (ft BMP) — Equipment Decon Method: 3.2 Quee Groundwater Disposal: Groundwater Dispo	
Screen Top: (ft BGS) = ZSSS (ft BMP)	
Depth to Water Before Pump Installation (ft BMP): 27.01 Time: 1/34 Pump and Tubing Type: 41.7 1 Well Volume (gal) = (Total Well Depth - Depth to Water) x Well Capacity = 0.67-12.01 Pump Intake Depth (ft BMP) — Equipment Decon Method: 3.2 Quee Groundwater Disposal: GW- GW- G	
1 Well Volume (gal) = (Total Well Depth - Depth to Water) x Well Capacity = 0.67 - 12.01 Pump Intake Depth (ft BMP) - Equipment Decon Method: 3.7 Came Groundwater Disposal: GW - Gwd Time ment Volume Volume Purge Depth to Start Time Purged Purged Purged Rate Water pH Temp Cond. Turbidity Oxyge (hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NTUs) (mg/L) 1037 1055 12.25 12.25	
Equipment Decon Method: \$3 Curco Groundwater Disposal: GW- Gwo Measure-Time ment Volume Purge Depth to Start Time Purged Purged Purged Rate (hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NS/cm) (NTUs) (mg/L) 1037 1055 12-25	
Measure- Time ment Volume Volume Purge Depth to Specific Cond. Turbidity Oxyge (hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NTUs) (MTUs) (mg/L)	
Time ment Volume Volume Purge Depth to Specific Cond. Turbidity Oxyge (hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NS/cm) (NTUs) (mg/L)	
Start Time Purged Purged Rate Water pH Temp Cond. Turbidity Oxyge (hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NS/cm) (NTUs) (mg/L)	Redox
(hrs) (hrs) (gal) (gal) (gpm) (ft BMP) (pH Units) (°C) (NS/cm) (NTUs) (mg/L	
1037 1055 +2.25 -2.25 -	-CTR CHITTE - CONTROL
	11/2
103 101 1010 1617 1615/1	70-10
	30-107
	1
(3	- \
17 17	
A CONTRACTOR OF THE CONTRACTOR	
	1
	1
	+
	_
* Well Capacity (Gal/ft) for PVC Sch 40 Nominal Pipe Sizes: 0.75" = 0.026; 1" = 0.043; 15" = 0.163; 2" = 0.171; 4" = 0.652; 6" = 1.484; 12"	= 5.766
SAMPLING DATA	
	1445
Field Decontamination: Y N Field Rillered: Y N QA Duplicate: Y N COC Time: 142	5177
Material Codes: VOA=40 ml glass vial; AG=Amber Glass; CG=Clear Glass; PE=polyethylene; O=Other (Specify) COC Number:	1
Sample ID QA/QC Samples/ID Sample Container Specification Remarks: (color, odor, sand & silt content, faction)	tore passible
Material Preserv. Intended Analysis Affecting samples; condition of vault, wellhead	
No. Code Volume Used and/or Method appartus, etc.)	. •
Sitiale: overflow	
the Area To Maryou Switch	
Signature(s):	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts



smile

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page of 1

DT Henderson Nevada

$\underline{}$					rge volu	me wetr				ERT, Hender	son, Nevada		
Task Name:	At how	Trease	bility "	tudy		Task Manage	er: 0 · Ayyı	W HAM !	Well ID: 4	Flw-07I			
Field Sample	ers: J. Lc	grade		a		Task No.: ^	113		Date: 64 Apr 19				
		Det Barrie	HILLS DESIGN	LIBS In	PURGI	NG DATA	(3) 1355	SEDIV YOU					
MP Distance	AGS (ft): -	_	Well Depth (f	t BGS): 👤	le proposition per	Well Depth (f	Depth (ft BMP) 41.27 Nominal Well Pipe Size (in):						
MP Descript	ion: TO C		PID/FID Read	dings Beneal	th Inner Cap (parts per million above known background):								
Screen Top:	(ft E	3GS) =	(ft BMP)	Screen Botte	om: (fl	BGS) =	(ft BMP)	Well Riser C	apacity* (gal/f	t): —			
			n (ft BMP): 2 €		Time: 092	0		ubing Type:	THE RESERVE AND ADDRESS OF THE PARTY OF THE				
			- Depth to Wa		apacity = 2.	52 +7.56				- In the			
		I MWL		·		r Disposal: (
	Measure-		Cumul.		Lean State						Redox		
Time	ment	Volume	Volume	Purge	Depth to			Specific		Dissolved	Poten.		
Start	Time	Purged	Purged	Rate	Water	pH	Temp	Cond.	Turbidity	Oxygen	ORP		
(hrs)	(hrs)	(gal)	(gal)	(gpm)	(ft BMP)	(pH Units)	(°C)	(µS/em)	(NTUs)	(mg/L)	(mV)		
0125	0155	N8.00	~ 00		1								
1410	rw	~U.LS	NF. 25	_	26.84	5.73	25.54	8.46	40.8	1-82	-201		
					1								
	1	-	-							1			
		1	-	<u> </u>)						
				 			/_	-r.					
-	1	-			-			JL					
			ļ					4-11-17					
								<u> </u>					
								,					
<u> </u>								ļ					
ļ	1	1		<u> </u>	(<u></u>					
	<u> </u>	-	-	<u> </u>	<u> </u>								
118/all O-r -	nika (Octob) z-	- DVO 0-5-40	Marsin - LDir -	Pi 0.75	0.000: 45	0.040 4.51	0.400 61	0.474 4"	0.05001	4.404. 401	700		
weii Capa	city (Gai/it) to	r PVG Sch 40	Nominal Pipe	5/zes: 0./5"			= 0.103; 2"	= 0.1/1; 4" =	0.652; 6" = "	1.484; 12" = 5	./66		
					SAMPL	ING DATA		1 %	ė				
Sampling M		7/1				 	tiated (hrs):i	~		ded (hrs): -	·		
Field Decon		y) N	Field Filter	——У—	N	QA Duplicate		W	COC Time:	_			
			vial; AG=Ambe			PE=polyethyle	ene; O=Othei		COC Numbe				
Sample ID	UFI~	-07I-	11 HUF103	Duplicate	ID: ~				nples/ID				
S	ample Conta	iner Specifica	tion	118						content, factors It, wellhead, sa			
	Material	1115-18	Preserv.		ntended Analy		appartus,	-	idition of vau	n, weilleau, S	aubind		
No.	Code	Volume	Used	1	and/or Metho	O .			14- 1412	(Å - A			
		ļ					1 70	, Phaei	more	~~			
	p [].	JE N	1	JoH-									
10			16.3	0.1									
										-			
							Signature	e(s):					
	·									_			

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface min - Minute mg/L - milligram/Liter mV - milli Volts



ZWV

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page _ of _

$\underline{}$					ige voiu	ille meu			N	ERT, Henders	son, Nevad
Task Name	: AT AN	va Treat	ability St	andy		Task Manag	er: A. Ay	g pp v Au I	Well ID: U	IFIW- OFS	
Field Sampl	iers: ゴ. レu	gade	•		12:04	Task No.: ^	ដេ ៉ា		Date: 10 A	pr 19	
127587107430		THAT PASS		and the	PURGI	NG DATA	Name and Associated Section				
MP Distanc	e AGS (ft):	_	Well Depth (fi	BGS): ~		Well Depth (t BMP) 29.	52	Nominal We	Il Pipe Size (in):	2
MP Descrip	tion: TdC		PID/FID Read	dings Beneat	h Inner Cap (j	parts per millio	n above knov	n background	d): —		
	marks or other states	3GS) = 74.4	1 (ft BMP)							ft): ~	
			n (ft BMP): 🗻		Time: 1109			bing Type:	The second second second second		
			- Depth to Wa								
	Decon Method				Groundwate	· · · · · · · · · · · · · · · · · · ·	GW-11	Pond	'		
Equipment	Measure-		Cumul.		arounditate	т Біороваі.	0 10 11	10/10/	Sec.	No.	Redox
Time Start (hrs)	ment Time (hrs)	Volume Purged (gal)	Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond. (S/cm)	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Poten. ORP (mV)
11:10	1130.2	ul . 50	2.1							The fort	
13416	1345					7.28	31.09	5.54	25.2	8.02 1.48	-110
		/									
								1			
						 		1			
				1		 			-	+	
					1	 					
		+		-					1		
		 			+	 	-		1		
- +		-	-		-	 	-		1	-	
		 	-			 			box		
	\					ļ				4	/
	1	+		_		 			\ \	10.13	/
	+	+		_		/					/
	+	+/				/		-			
* Well Cana	rity (Gal/ft) fo	r PVC Sch 40	Nominal Pine	Sizes: 0.75"	- 0.026: 1"-	- 0 043· 15"	= 0.103· 2" -	- 0 171: <i>1</i> " –	0.652: 6" =	1.484: 12" = 5	766
TYCH Oapa	iony (diame) to	11 40 0011 40	Hommar i ipo	JIEC3. 0.73	•	ING DATA	- 0.100, 2 -	- 0.171, 4 =	0.032, 0 =	1.707, 12 - 3.	.700
Sampling M	lethod(s):				SAMIFL	Sampling Init	tisted (hre):	1345	Sampling En	idad (hes): 1 U	75
	ntamination:	ΥN	Field Filters	nd· V	N	OA Duplicate					<i>(</i>)
								(C===if-)	COC Number	1342	
	UFIW-		vial; AG=Ambe			rc=polyetnyk	ene; U=Utner		COC Numbe	n: <u> </u>	
				Duplicate	IU:		Remarke	QA/QC Sai		content, factors	noceible
No.	Sample Contai Material Code	Volume	Preserv. Used	le	ntended Analy and/or Metho			samples; co		ilt, wellhead, sa	
ΛΛ.		- 0	, , ,				80	(fide	: Over	How	
FW 1	rea -	15 8 an	phy ?	5 एकेर					10		
							Signature	(s)·	SV	1	
		<u> </u>					- Olginature	(~/-			

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface min - Minute mg/L - milligram/Liter mV - milli Volts



Sumple

GROUNDWATER SAMPLING LOG

Page d of 1

$\underline{}$				(Pu	irge voiu	ime ivietr	10a)			ERT, Hender	son, Nevada	
Task Name:	AP Ave	a Treut	childy st	day		Task Manag	er: A A	ירט פטץ	Well ID: 0	(FIW-08I		
Field Sample	ers: J. L	س پسلو	,	,		Task No.: M	ដ		Date: 1 1 A	av 17		
TORON ON	Kenin ji		HORSINES		PURGI	NG DATA	- 1		(82)		332-1111-	
MP Distance	e AGS (ft): -	-	Well Depth (f	BGS): -		Well Depth (ft BMP) 3†.	89	Nominal Wel	l Pipe Size (in):	a.	
MP Descript	tion: TOU		PID/FID Read	dings Benea	th Inner Cap (p	oarts per millio	n above kno	wn backgroun				
Screen Top:	: (ft E	3GS) =	(ft BMP)	Screen Bott	om: (fi	BGS) =	apacity* (gal/f	t): 🕶				
			n (ft BMP): 🚜		Time: 102		T	ubing Type:			T,E	
Committee of the Commit	Charles of the control of the contro		- Depth to Wa			-						
	Decon Method					r Disposal:		and the second second	1			
Time Start	Measure- ment Time	-	Cumul. Volume Purged	Purge Rate	Depth to Water	рН	Temp	Specific Cond.	Turbidity	Dissolved Oxygen	Redox Poten. ORP	
(hrs)	(hrs)	(gal)	(gal)	(gpm)		(pH Units)		(µS/cr h)	(NTUs)	(mg/L)	(mV)	
10 26	1105	~7.6	~7.0									
1435	1435	~0.25	N7-25	_	26.61	5.85	24.47	9,73	11000	3.30	-213	
											>	
		-			-							
					<							
								150 500				
		1						34				
-					1	/		4-11-17-				
	1								 			
								+				
-		-	-		-	/						
			-		-			1	-			
	-		-		/			-				
	-	-						-				
				(
* Well Capa	city (Gal/ft) for	r PVC Sch 40	Nominal Pipe	Sizes: 0.75°	= 0.026; 1" =	= 0.043; 1.5"	= 0.103; 2"	= 0.171; 4" =	0.652; 6" =	1.484; 12" = 5	.766	
					SAMPL	ING DATA						
Sampling M	ethod(s): Ru	ıL				Sampling Init	tiated (hrs):	435	Sampling En	ded (hrs): -		
Field Decon	tamination:	(Y) N	Field Filtere	ed: (Y)	N	QA Duplicate	e: Y (N)	COC Time:	J		
Materia	I Codes: VOA	=40 ml glass	vial; AG=Ambe	r Glass; CG	=Clear Glass:	A		(Specify)	COC Numbe	r: –		
	WFIW-			Duplicate		- 1-7-1	1000	QA/QC Sa		_		
	Sample Contai							: (color, odor	, sand & silt o	content, factors		
No.	Material Code	Volume	Preserv. Used	l l	ntended Analy and/or Metho		affectring appartus	etc.)		lt, wellhead, sa	impling	
								SUPILE	,; Oven	Plu		
Ae.	Andr	(Junp	ing Sc	4								
							C' :	100	2		-	
	1	11	1				Signatur	e(s):		1	_	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

MP - Measuring Point NTU - Nephelometric Units

	TETRA	TECH
3 (1-1)		

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page ___ of ___ NERT, Henderson, Nevad

Task Name	e: HP Arca	restabi	1174 Stud	4		Task Manager: And Ayy 164m, Well ID: UFM W-015							
Field Samp	plers: D. Ke	ady		/		Task No.:	MI3	11	Date: 4-1	>-12	0		
		1			PURG	NG DATA	Tarri Tarri			- 17			
-	ce AGS (ft):		Well Depth (ft BGS): Z	9	Well Depth	(ft BMP) -		Nominal We	Il Pipe Size (in):	7		
MP Descrip	ption: TO	٧	PID/FID Rea	idings Beneal	th Inner Cap (parts per milli	on above knov	wл backgrour	1d):	11 1pc 0126 (111).			
	p: (ft E		(ft BMP)	Screen Botto	om: (f	t BGS) =	(ft BMP)	Well Riser (Capacity* (gal/	41.			
Depth to W	/ater Before Pu	mp Installatio	n (ft BMP):	28.61	Time:		Pump and To		supposity (gas)	4.			
1 Well Volu	ıme (gal) = (To	tal Well Depth	- Depth to W	ater) x Well C	apacity =		Pump Intake		10)				
	Decon Method				Groundwate	r Disposal:	- amp intakt	Deptir (it bit	117				
	Measure-		Cumul.	- AKO 17 -		10-10 Table 1							
Time Start	ment Time	Volume Purged	Volume Purged	Purge Rate	Depth to Water	pН	Temp	Specific Cond.	Turbidity	Dissolved Oxygen	Redox Poten. ORP		
(hrs)	(hrs)	(gal)	(gal)	(gpm)	(ft BMP)	(pH Units)	(°C)	(µS/cm)	(NTUs)	(mg/L)	(mV)		
1 -													
LES	STHAN	l" c	F WAT	ER OB	served	y WE	HI UNP	BIF	BSAMP	E.			
								_/					
			-				11 12 11	2					
						J.K	4.12.1	7					
					·	<u>U</u>							
	-												
Well Capac	city (Gal/ft) for I	PVC Sch 40 N	Iominal Pipe S	Sizes: 0.75" =	0.026; 1" =	0.043; 1.5":	= 0.103: 2" =	0.171: 4" =	0.652 6" = 1	.484; 12" = 5.7	7CC		
						NG DATA			0.002, 0 - 1	.404, 12 = 5.7	00		
ampling Me	ethod(s):					Sampling Initi	ated (hrs):		Sampling End	ad (hea):			
ield Decont			Field Filtere		N	OA Duplicate	У N		COC Time:	en (ms)			
Material	Codes: VOA=	40 ml.glass vi	al; AG-Amber	Glass; UG=0	Clear Glass: P	E=polyethyle		Snecifu\	COC Time: COC Number:				
Sample ID				Duplicate ID);			AAQC Sar					
Si	ample Contain	er Specification								ntent, factors p	anaible.		
	Material	T	Preserv.	Inte	ended Analysi	s I	attectring sa	amples; con	dition of vault,	wellhead, sam	iossibiy iolina		
No.	Code	Volume	Used		nd/or Method		_appartus, et	tc.)		, - 411			
							INCO	IFFICIAN	IT AM	OUNT of	_		
							WA		N WELL	- 70			
								SAM	PUE.				
							Cienatura		-011				
CC Polow	Ground Surface	20 = 8242	200 Obsis				Signature(s	J. (1)	4 1				

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody
Cond - Specific Conductivity
GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

	150.0	
Tt	TETRA	TECH

	- 1				JW GR	UUNDV	VATER	SAMPL	.ING LC)G		NI	ERT. Hender	son, NV Proje	
Task Name: AP Area	Treatability	1 Study Ti	ask Manage	r. Are	J AY	4 suami	•	Task No:	M.13			Well ID: UFMW-01I			
Field Samplers: N	ady	<u> </u>			7-17			Recorded b	y: D.Ke	adu		Date: 4 -			
Well Depth (ft BGS):		istance AGS (ft):			Well Depth ((ft BMP):	74	Screened/O	pen Interval T	op:	•	(ft BGS)	34	(ft BM	
Well Diameter (in): 2		ID Readings Ben						Screened/O	pen Interval B	ottom:	•	(ft BGS)	39	(ft BM	
Pump and Tubing Type:	edicate o	(astir pun	pol	y ful.y	Pump Intake	Depth: 36	.5	(ft BOS)	ur -		(ft BMP)	MP Description	on: TOC		
Equipment Decon. Method:	3 bucket	more dec	en of de	ialdel	Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	28.54	Time:	1845	GW Disposal	GW-11		
Time ADURGING RE	Temp. (°C)	pH (pH Un		Spec Cor	nductivity /cm)	Dissolve DO (d Oxygen mg/L)	122 4 224 4	Potential (mV)		oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged	
Time E S RE	AD CHANGE*	READ C	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)	
	.48	7.56		4.97		1.33/4.8		83		0.0		[90	28.68	0	
0912 X 25.	57	7.58		4.85	-	0.48/3.32		88		0.0		100	28,67	500	
0917 X 25.	95	7.63		4.83		0.24/2.50		88		0.0		100	28.48	1000	
0922 X 26		7.65		4.83		0.13/1.94		89		0.0		100	28.67	1500	
0927 X 75PO	42	FLET		4.92		0.03/1.8		89		0.0		100	_		
0932 X 76		7.65		4.83		0.01 (1.7)		89		0.0		100	28.69	2000	
	.68	7.67		4.82		0.00/1.75		88		0.0		100		3000	
	TARILIZA	VID 2	1	4106		0.00/1.7		00		0.0		140	28.69	3000	
1												73			
				1								1	$\overline{}$		
			/			-			 \-			X		/	
	1	/					/		- \ - 			/		$\overline{}$	
									 		· O//			_	
									\-						
									\						
Sample ID: VEMW- D	11-20170411	Du	plicate ID:					04/00.0	1 112						
Sample Containe			piicate ib.		a day was	Material Co		QA/QC Sam		Classi CC =	Class Class		COC Time: (S	2496	
Material					Congress of	Field Decor	itamination:	Y N	Field Filtered:	Y N	COC Number		ne; ∪=∪tner (S	specify)	
Number Code	Volume Pre	servative	Intended Ar	nalysis and/o	r Method	Comments:					OCO Manibol	-			
						2.	VIFIZE:	0.00	mg/	1 -					
AP Arrea S	amplify					1			TR 1						
13. 13.		- 01				1	7	1	M_{\odot}						
	Signature(s):														
*INDICATOR PARAMETE	RS HAVE STABLE	ZED WHEN 3	CONSECL	ITIVE REA	DINGS ARE	WITHIN									
± 0.1 for pH; ± 3%	for Specific C	onductivity	and Ten	nperatur	e: ±10 i	my for Re	dox Poter	ıtial: ±	10% for D	issolved	Oxygen a	nd Turbid	itv		
BGS - Below Ground	Surface (C - Centigrade		GS - Ground	d Surface	ma/L - millia	ram/l iter	min - Minut	a 1	ID Mossies	on Doint	-	A Quality A-	10	

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

MP - Measuring Point NTU - Nephelometric Units QA - Quality Assurance QC - Quality Control

TETRA TEC
TETRA TEC

GROUNDWATER SAMPLING LOG

(Purae Volume Method)

Page / of /

	Task Name	E AT Ares	Treuto	hilbs I	L. 1	argo ron					NERT, Hender	son, Neva		
	Field Samp	olers: J. L	ua ed.	BI II M	URY		l ask Mana	ger: A. Ay	TWHAT	Well ID:	4 FMW -	N 031		
	a Unces		17400			BUG	Task No.:	MIZ		Date: 12	Date: 12 Apr. 17			
	MP Distance	ce AGS (ft):	_	Well Depth	(ft BGS): —	PURG	ING DATA							
	The state of the s	otion: TO	-0 200 0-				Well Depth	(ft BMP) 29	, 25	Nominal Well Pipe Size (in): 3				
				/# PMD)	Caraca Bas	ath Inner Cap	parts per mill	ion above kn	own backgrou	nd): —	d): apacity* (gal/ft):			
	Depth to W	ater Before P	ump Installatio	(ILDIVIP)	Screen Bot	tom:(ft BGS) =	(ft BMP	Well Riser	Capacity* (gal	ft): —			
											1			
	Equipment	Decon Metho	otal Well Depti	i - nehiii 10 A	vater) x vveii (Capacity = V	32 4 0.16	Pump intak	e Depth (ft BI	(P) -				
	Equipment	Measure		The Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of the Party Name of Street, or other Designation of Street, or other Designa		Groundwate	r Disposal:	-W-11	- Plak					
	Time	ment	Volume	Cumul. Volume	D		4-1-1		molen			Redox		
	Start	Time	Purged	Purged	Purge Rate	Depth to Water	1	_	Specific		Dissolved	Poten.		
	(hrs)	(hrs)	(gal)	(gal)	(gpm)		pH (pH Units)	Temp	Cond.	Turbidity	Oxygen	ORP		
3WV	3030	8030	N1.U	~7.0	(51 7)	(Colon)	(Pri Otiks)	(°C)	(p5/cm)	(NTUs)	(mg/L)	(mV)		
SAMPLE	1210	1216	20.25	~1.25		70.101	(2-1							
						27.44	6,30	26.61	6.50	2(1	2.95	12		
		 -	-		<u> </u>									
		ļ												
								\rightarrow						
								/_						
									JL					
									4-12-17					
								,						
4	-													
3)							
`		*												
1	* Well Canacit	v (Gal/ft) for I	DVC Sch 40 N	ominel Die - C	2									
ŀ	17011 000001	y (Gainty Ioi 1	VO 3011 40 IV	ommai Pipe S	oizes: U.75" =	0.026; 1"=(0.043; 1.5" =	0.103; 2" =	0.171; 4*=	0.652; 6° = 1.	484; 12" = 5.76	36		
ŀ	Sampling Meti					SAMPLIN	IG DATA							
ľ							Sampling Initia	ted (hrs): 1	LIU	Sampling Ende	ed (hre): —			
-	Field Decontar) N	Field Filtered	t: (Y) 1	<u> </u>	A Duplicate:	YN		OC Time:	(1.1.5).			
	Matenal C	odes: VOA=4	10 ml glass via	il; AG=Amber	Glass; CG=0	lear Glass; PI	=polyethylen	e: 0=0ther (:	Specify) (COC Number:				
1	Sample 1D	71110-	A F 7		Ouplicate ID	: -			QA/QC Sam					
	San	nple Containe	er Specification		15-5			Remarks:	color, odor, s	and & silt cor	itent, factors po			
- 1	No.	Material		Preserv.		ended Analysis		ancerning St	annhiez; coud	ition of vault,	welihead, samp	olina		
ŀ	No.	Code	Volume	Used	ar	nd/or Method		appartus, e	lc.)			9		
-								17.0	n 1	1.0	()			
-	1			Λ.				4711	fide V	15m 00.	L			
	ATA	veg D	mp hos	JU	-									
									-	-	7			
									11	6	-			
	CC. Delevi C		VIII. 1					Signature(s		2				
Þ	GS - Below G	iouna Suriac	e C	OC - Chain of	Custody	mi	n - Minute							

BMP - Below Measuring Point

C - Centigrade

Cond - Specific Conductivity GS - Ground Surface

mg/L - milligram/Liter mV - milli Volts

P - Measuring Point NTU - Nephelometric Units



LOW FLOW GROUNDWATER SAMPLING LOG

NEDT Henderson MV Project

							- 7	5.2	1000			180		141	LIVI, Hendera	suii, ivv Piujeci
Task Name:	AP An	a Treate	abo7.71 St	du	Task Manag	er: Arul	Aurasi	MANI		Task No:	MIZ			Well ID: U	FMW -0	ZI
Field Sample	ers: D	. Kead	ab 7,74 St				117/20				y. D. Ke	ady		Date: 4	-11-17	
Well Depth (ft BGS):		MP Di	stance AGS (ft):		Well Depth	(ft BMP): 3	()pen Interval T			(ft BGS)	34	(ft BMP)
Well Diamet		2			leneath Inner					Screened/C) pen Interval B	ottom: -		(ft BGS)	37	(ft BMP)
Pump and T	ubing Ty	pe: Deli	cated elas	tiz pump	; dedica	led ply	Pump Intake	e Depth: 36 (ft BGSBra (ft BMP): 28, 65 Time: 1945			(ft BMP)	MP Description		-		
Equipment D	есоп. М	ethod: 31	butet in	El: made	ras ford	edica the	Depth to Wa	iter Before Pur	np Installatio	n (ft BMP):	28,65	Time:	1015	-	: GWHI BY	nd
	اري ان ا	T.	emp.		Н						Potential					
			(°C)		Jnits)	Mus	(cm)	_DO (r	no/l\		Potential P (mV)	and the second second	bidity TU)	Purge Rate	Depth to Water	Cum. Vol.
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Dissolved DO (n READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	Purged (ml)
1024	X	6	-		01.11102		O. WINGE	107/200	OHAROL		CHAINGE		CHANGE	Page 924 As		(,
	-	79.08		7.55	<u> </u>	5.98		7.02/3.98		105	1	59.3	-	(00	28.77	
[03]	X	29.17	-	7.76		5.22		1.02/241		94	1	24.5		100	28.78	
1036	X	29.20	<u> </u>	7.83		5.04		0.66/2.32		90		12.8		100	28.79	
140	X	79,20		7.83		4.90		0.31/173		89		5.9		100	28.80	
1046	X	29.23		7.82		4.75		0.11/1.69		88		0.0		100	28.80	
1051	X	29.74	,	784		4.75	/	0.09/1.69		86		0.0		100	Ze.80	
1056	K	29.59	V	7.82		4.73	V	0.04/1.66		86		0.0	J	100	78.80	
1105	X	1	-1 ZATION			1.12		0.0 (/).84		694		0.0		1-5	00,00	
1102	 	OlfBi	-I EMILOR		-						117					
	-									<u> </u>						
							ļ			6/		-				
						\			7	DY _						
		/														
	V															
Sample ID:	UFM	W-02]	L-2017A	411	Duplicate ID					QA/QC San	npies/ID:				COC Time:	1105
Sa	mple C	ontainer						Material Co	des: VOA = 4	0 ml glass v	ial; AG =Ambe	r Glass; CG	=Clear Glass;		ene; O=Other (
	Materi	and the same of						Field Decon	tamination:	Y N	Field Filtered	: Y N	COC Numbe	r:	,	
Number	Code	Volu	me Pre	servative	Intended A	Analysis and/	or Method	Comments:								-
								7,	Isde	: 0.01	5 mg/					
- AP	Are	7	10 10		7.		-	ll o			120					
	LJY	4 09	mp /il-	77	ite -				1	X.	-) []	i				
		_								\cl_						ĺ
*INDICATO	S DVD V	METERS	L HAVE STABL	IZED WHEN	3 CONGEO	TITIVE DE	DINGS AD	Signature(SJ:	7						
1400 14 120			Specific C						day Data	ntial:	100/ 5	Nanchier	10	and Total	ata.	
		Ground Surfa		C - Centigrad		GS - Grou		mg/L - millig		min - Min	10% for I	MP - Measu			QA - Quality A	
		Measuring P		COC - Chain		ID - Identifi		mV - milli Vo		ml - millili			ing rout Sometric Units		QC - Quality A: QC - Quality C	

T	TETRA	TEC
---	-------	-----

GROUNDWATER SAMPLING LOG

(Purge Volume Method)

Page ___ of ___

Task Name:	AP Ar	ca Trea	tability	Staly		Task Manag	er had	N. a. dan	- INCOLLED	EKI, Hender	son, Neva
Field Sample	ers: D. k	Lody	1	Jing		Task No.:	MI3	THYUNGO	Date: 4	UFMW-C	135
		1			PURG	NG DATA	<u> </u>		vale: 4.	12:17	
MP Distance	AGS (ft):	/	Well Depth (1	it BGS):		Well Depth (ft BMP)		Nominal 18te	I Dies Cies (C.)	
MP Descript	ion: Toc				Inner Can /	parts per milli	on above kno	wa baakan	Inounual Me	l Pipe Size (in):	2
Screen Top:	(ft !	3GS) =	(ft BMP)	Screen Botto	m. /f	PGCI -	A DIND	wir backgrour	apacity* (gal/f		
			n (ft BMP): T	Zev	Time:	1000/ =			apacity" (gal/f	t):	
			ı - Depth to Wa		anacity =			ubing Type:			
	econ Method				Groundwate	r Disposalı	Pump intake	Depth (ft BM	P)		
	Measure-		Cumul.	- Part - Part	Cionidasie	i Disposal,					
Time Start (hrs)	ment Time (hrs)	Volume Purged (gal)	Volume Purged (gal)	Purge Rate (gpm)	Depth to Water (ft BMP)	pH (pH Units)	Temp (°C)	Specific Cond. (µS/cm)	Turbidity (NTUs)	Dissolved Oxygen (mg/L)	Redox Poten. ORP (mV)
1./10	i opC	150									
WEL	r OBZI	RVED	TO BE	DRY	; UN	ABLE -	O SA	MPLE			
		-							1		
							11 17	2-17			
						AC	y 1/	6-17			
						1					
				-							
_											
* Well Capacit	y (Gal/ft) for I	PVC Sch 40 N	Iominal Pipe S	izes: 0.75" =	0.026; 1" =	0.043; 1.5" =	0.103; 2" =	0.171: 4" = 0	0.652: 6" = 1	484; 12" = 5.7	88
						NG DATA			, ,	10-1, 12 -0.7	
Sampling Met					1	Sampling Initia	ated (hrs):	j	Sampling Ende	ad (hee):	
Field Decontai			Field Filtered			OA Duplicate:	У И		COC Time:	50 (1115).	_
Material C	Codes: VOA=	40 ml glass vi	al; AG-Amber	Glass; CG=C	lear Glass: P	E-polyethyler	ne: O=Other /		COC Number:		
Sample ID			0	ouplicate ID:				QA/QC Sam			
Sar	nple Contain	er Specification	n							ntent, factors p	
	Material		Preserv.	Inte	nded Analysi	s	anecong sa	amples; cond	lition of vault,	wellhead, sam	ossibiy Olina
No.	Code	Volume	Used		d/or Method		appartus, ei	tc.)		, , , , , , , , , , , , , , , , , , , ,	-···· 3
							N -				
							DRY	; UNA	BLF	TO JAMY	A ne
										10 0.1414	CE"
								~	1	1	
							G: .	. 1	10		
IGS - Below G	Cround Surface	20 /	COC - Chain of				Signature(s):			

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade

COC - Chain of Custody Cond - Specific Conductivity GS - Ground Surface

min - Minute mg/L - milligram/Liter mV - milli Volts

Page of

NERT, Henderson, NV Project Task Name: AP Area Treatability Stay Task Manager: And Anyourani Task No: M13 Well ID: UFMW-03I Field Samplers: D. Keady Recorded by: D. Kea du Date: 4-11-17 Well Depth (ft BMP) Well Depth (ft BGS): MP Distance AGS (ft): Screened/Open Interval Top: 30 (ft BGS) (ft BMP Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: Ho. (ft BGS) (ft BMP) Pump and Tubing Type: Dedicated plants army; dedicated the Pump Intake Depth: (FLBGS) LAV Pump and Tubing Type: Dedicated plants army; dedicated the Pump Intake Depth: 35 (fr. BEST My Equipment Decon. Method: 75 (fr. BEST My Depth to Water Before Pump Installation (fr. BMP): 76.50 (ft BMP) MP Description: - 10 9 1315 GW Disposal: GW11 Pond Time: PURGING SAMPLING **Spec Conductivity** Temp. pH Dissolved Oxygen **Redox Potential Turbidity** Purge Depth to Cum. Vol. DO (mg/L) (°C) (pH Units) M(uS/cm) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* READ CHANGE* CHANGE* Time READ CHANGE* READ (ml/min) (ft BMP) (ml) CHANGE* 1324 35.12 7.77 3.66 244/335 3.4 26.43 109 100 1329 X 7,81 3),52 3.79 7.20/2.80 106 0.6 26.43 100 334 29.99 3.26 7.80 1.81/2.16 104 0.0 26.43 100 339 29.27 3.26 7,81 127/145 26.43 0.0 00 100 1344 28.78 3.25 7.87 95 1.12/1.37 0,0 100 1349 78.73 3.29 7.88 94 0.98/136 0.0 1400 STABILLIZ ATTON UFMW-0 TI - 7:017-04/1 Duplicate ID: Sample ID: QA/QC Samples/JB! **COC Time:** 460 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: Sultide: 0.00 mg/L MIDIM Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxvgen and Turbidity GS - Ground Surface

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centiorade COC - Chain of Custody

ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page 1 of 1

	_				L	JAA LT	JAN GK	DOMEN	MIER	SAMPL	ING LU	JG		N	ERT, Hender	son, NV Projec
Task Name:	AP	AREAT	reatabil	1 ty Stud	Task Manag	er: A)u	l Auus	JAUM-mi	-	Task No:	MI3				FMW-C	
Field Sample	ers: 🔟	acob	SOUZO	<u>, </u>	J		77	4		Recorded b	у: Тасок	5002	70		17/17	<u>/ 19</u>
Well Depth (it BGS):		MP Di	stance AGS (ft BMP): Z.G	7.69		pen Interval T		,	(ft BGS)	24.0	(ft BMF
Well Diamete		2	PID/FI	ID Readings E	Beneath Inner	Cap (ppm cg	e akb):			Screened/C	pen Interval E	Bottom:	/	(ft BGS)	29.0	
Pump and To		pe: QE	D Sam	ple Pro	/poly+	ubung	Pump Intake	Depth:		(ft BGS)	26.50		(ft BMP)	MP Descripti	ion: T,O,C	
Equipment C	есол. М	ethod: L	quimox '	c water	(x3)		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	26.79	Time: C	755	GW Disposal		
	ပြု မြို့	Te	emp.) p	H	Spec Co	nductivity	Dissolve	Oxygen	Redox	Potential	Turk	oidity	Purge	Depth to	Cum. Vol.
		=	(°C)	(pH l	Jnits)	(uS	/cm)	DO (r	ng/L)	The William State and the	(mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0850		25,84		7.21		4500		2.11		150	<u> </u>	3.5		105	24.50	Ø
0855		26.31		7.38		4490		1.63		142		0.0		105	26,50	525
0900 26.76 7.47 4490 1.77 136 0.0 105 26.50 1050 0905 26.58 7.47 4400 3.69 135 18.00 105 27.02 1575																
	0905 26.58 7.47 4400 3.69 135 18.00 105 27.02 1575															
	0905 26.58 7.47 4400 3.69 135 18.00 105 27.02 1575 10910 26.56 7.43 4540 1.85 129 10.3 105 27.04 2100															
0915	0910 26.56 7.43 4540 1.85 129 10.3 105 27.04 2100 0915 26.98 7.52 4470 1.35 129 0.00 105 27.06 2625															
0920	0910 26.56 7.43 4540 1.85 129 10.3 105 27.04 2100 0915 26.98 7.52 4470 1.35 129 0.00 105 27.06 2625															
0925		2696		7.51		4470		1.13		131		0.00		105	27.07	3675
0930		26.99		7.51		4470		1.10		128		0,00			27.07	
0935		26.97		7,51		4480		1.12		128		0,00		105	100	4200
4		22011		13.51		17 60		1412		120		0,00		105	27.07	4725
													-			
	\															
Samula ID:	1 1 1 4 4		C 0 2 1 5	A/ (= >=	5 11 15											A 1 :
		ontainer	5-201	1040.1	Duplicate ID:	NA					ples/ID: N				COC Time: O	
Ja	Materia			E :					des: VOA = 4 tamination:		il; AG =Ambei Field Filtered:		Clear Glass; COC Number		ene; O=Other (Specify)
Number	Code		ne Pre	servative	Intended A	nalysis and/o	or Method	Comments				1				
								C,	10/10	= 0.0	2 mall	_				
	^				L ~			"	0	- 1	7		1 - 07 E	SV EF C	due to la	シケア
A	1 1	20	July 14	y 18	Λ			* a	+ 090	5 adji	noted t	ump -	10 Z 11-	10 17	, we . o	
									0/1	flow."	'	,				
INDICATOR	0.000	METERO	IAVE OTABLE	IZED 1404511	2.000000	LITTU (F. D.C.)	DINOC : 5		s):							
			AVE STABL						dan Datii	42-1-	400/ 5 =					
- 0.1 101	VI.I+ -	# 0 /0 101 ·	Specific C	OHOUCHY!	ra alid 16	mhetairil	G. IIV	IIIA TOL KE	uox Potei	nciai: ±	10% for E	Jissolved	Oxygen a	<u>and Turbic</u>	vitt	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

Page 1 of 1

					Lo	OW FLO	OW GR	OUNDV	VATER	SAMPL	LING LO)G		, A	JERT Hands	rson, NV Proje
Task Name	TAP	AREA	Treatabi	lity Stu	Jask Manag	er: Aru	D Aug	((V h)() %	<u> </u>	Task No:					UFMW.	
		<u> </u>			_		7.33	<u>ukuwunii i</u>	<u> </u>	Recorded b	»: Jaco	h 5-	137.0	Date: 4		OHT.
Well Depth (istance AGS			Well Depth	(ft BMP)	39.79	Screened/C	Open Interval T	op:	UZO.	(ft BGS)	34.0	O (ft BM
Well Diamet	er (in):	2	PID/F	ID Readings	Beneath Inner	Cap (ppm cg	ge akb); /				pen Interval B		/	(ft BGS)	39.0	
Pump and T	ubing Ty	ype: QE	Sampl	erro/	poly tu	bina	Pump Intake	e Depth:		(ft BGS)		4.50	(ft BMP)		lion: T, O, C	
Equipment 0	econ. N	lethod: 1	quinox'	Waster	(×3)	<u> </u>	Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	26.79	Time: /	429		al: GW-I	
	PURGING	Т	emp. (°C)		oH Units)		nductivity /cm)	 In the service of the service 	d Oxygen mg/L)		Potential (mV)		bidity TU)	Purge Rate	Depth to Water	Cum. Vol.
Time	2 8	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	Purged (ml)
1459		32,31		7.61		4240		1.20		118		19.8		120	26.85	Ø
1503		31,21		7.70		4280		1.03		116		23.4		120	26.85	480
1507		30.34		7.69		4350		0.87		116		17.6		120	24.85	960
1511		29.97		7.74		4410		1.29		119		15.2		120	26.85	1440
1515		2991		7.73		4430		0.92		123		13.1		120	26.85	1920
1519		30.23		7.74		4470		1.05		723		10.0		120		2400
1523		30.76		7.74		4520		0.92	-	113		7.7		120		2880
527		30.85		7,74		4530		1.16		113		6.1		120	26.85	
1531		30.81		7.74		4520		1.10		110		6.3			1	3360
535		30.76		7.74		4520		1.08	<u> </u>	112		5,8		120	26,85	3840
4						1020		1100		11/2		2,0		120	26.85	4320
ii (
Sample ID: {	JFM\	N- 041	-20170	406	Duplicate ID:	NΙΔ				24/00 0	1 425 4	<u> </u>				
		ontainer	ī	<u> </u>	0Ti	1071	- = 0 = 640	Material Cor		QA/QC Sam			0101		COC Time:	1540
2011	Materia	- 3						Field Decon	tamination:	Y N	Field Filtered:	V N	CIEar Glass; I COC Number	-=polyethyle	ene; O=Other (Specify)
Number	Code	Volun	ne Pres	servative	Intended A	nalysis and/o	r Method	Comments:			T TOTAL T MOTOG.	,	COO Humber	·		
	^		7					5	ulfide	= 0.0	o mg/L	_				
<u> </u>	[स्र	24	Jungling	Jot					O		7					
,																
(NIDIO:=55		+5						Signature(s):							
INDICATOR	PARA	METERS H	AVE STABLE	ZED WHEN	3 CONSECU	JTIVE READ	DINGS ARE	WITHIN								
BGS -	Below G	round Surfac	Specific Co	ONGUCTIVI Captionada	ty and Ter	nperature	2: ±10 r	nv for Red	lox Poten	tial: ±	10% for D	issolved	<u>Oxvgen a</u>	nd Turbic	lity	

BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

LOW ELOW CROUNDWATER CAMPLING LOC

		NERT, Henderson, NV Project Sk Name: AP AREA Tructability Study Task Manager: Arul Ayya Awamî Task No: M13 Well ID: UF MW-055 Recorded by: Jacob Souza Date: 4/7/17														
Task Name:	<u>AP A</u>	REATIVE	<u>latabili</u>	ty Stud	Task Manag	er: Arul	L Ayya	Awam	î	Task No:				Well ID: U	FMW-C)55
Field Sampl	ers: <u>J</u>	<u>acob</u>	SOUZO	<u>_</u>			77			Recorded b	y: Jaco	b 501	JZQ	Date: 4	דוודי/	
Well Depth				stance AGS (Well Depth (ft BMP): 3	0.04	Screened/C	pen Interval T	op: /	,	(ft BGS)	25.00	(ft BMP)
Well Diamet		2			Beneath Inner					Screened/C	pen Interval B				30.00	(ft BMP)
) Sampl				Pump Intake		/	(ft BGS)		.50	(ft BMP)		on: T.O.C	
Equipment 0			gumox	water	(x3)		Depth to Wa	ter Before Pu	mp Installation	n (ft BMP):	27.01	Time:	1030	GW Disposa	1: GW-11 f	<u>)</u> ආප
	PURGING SAMPLING	Т	emp. (*C)		oH Units)	Children and the latest and the late	nductivity (cm)	The spin-spinish control to the last of	d Oxygen ng/L)		Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	S E	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1055		27.61		7.31		7390		1.66		145		623		100	27.09	Ø
1100		27.65		7.30		7360		1.43		145		359		100	27.10	500
1105		27.73		7.29		7240		1.35		142		57.3		100	27.14	1000
1110 27.75 7.30 7200 1.23 137 17.2 100 27.21 150															1500	
1115 27.79 7.31 7180 1.16 134 4.4 100 27.25 2															2000)	
1120 27.82 7.30 7110 1.16 132 0.0 100 27														27.28	l .	
1125 27.84 7.31 7060 1.14 131 0.0 100															27.28	<u> </u>
1130	- -	27.86		7.31		7120		1.14		127		0.0		100	1	3500
			-			20	 			12.	-	010		100	- 1.20	- 300
		 	1					-							-	
				(2)										-	<u> </u>	
																/
										ļ. <u>-</u>						
10																
Sample ID:	115463	1-056	- 20170	7	Duplicate ID:	NA				04/000	1 10 41	Λ				1100
		ontainer	ZOI 10.	101	Dupitcate ID	107		Material Co			ples/ID: N		-Cloor Cloos		COC Time: ene; O=Other (1135 (Specify)
	Materi							Field Decon	itamination:	Y N	Field Filtered	Y N	COC Number		ine, O=Ollier (Specify
Number	Code	Volur	ne Pre	servative	Intended A	nalysis and/o	r Method	Comments:	****				i o o manipol	•		
								1 5	oul/ide	2= 0,0	00 mg/	<u></u>				
_ A.	,	drea	Sumpl	In Cal					0		9					
		0,04	201	8.0	4 -											
		-	-					Cianatural	-\.							
*INDICATO	R PAR	METERS H	AVE STABL	IZED WHEN	L3 CONSEC	LITIVE REA	DINGS APE	Signature(:	>J							
			Specific C						dox Poter	ntial: +	10% for F	lissolven	Oxygen:	and Turbi	dity	
			re .									UD Hannu			OA Overflu A	70000

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



<u> </u>										9/ lilli L		-		N	EKI, Mender	son, ivv Projec
Task Name:	AP A	REA True	atabilitu	Studu	Task Manag	er: A Rus	Aura	pmami		Task No:	MIS				FMW-C	
Field Sample			Souza				22			Recorded b					רוור	
Well Depth (stance AGS (ft): /		Well Depth (ft BMP): 3	9.87		pen Interval T	ор: /		(ft BGS)	35.00	(ft BMP
Well Diamet		2	PID/Fi	ID Readings E	Beneath Inner	Cap (ppm cg		/			pen Interval B		<u>'</u>	(ft BGS)	40,00	
Pump and T	ubing Ty	pe: QED	Sample	Pro/	olutuk	NWO.	Pump Intake	Depth:	/	(ft BGS)	37.5		(ft BMP)		ion: T.O.C	
Equipment D	econ. M	ethod: Lic	zumox ¿	water (x3)		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	26.90		20		1: GW-11 P	
2 -	ြ ပြ	Те	emp.	l p	Н	Spec Cor	nductivity	Dissolve	d Oxygen	Redox	Potential		bidity	THE RESERVE THE PARTY OF THE PA	Depth to	Cum. Vol.
			*C)		Jnits)	(uS	WITH BELLEVISION OF THE PARTY.		mg/L)	the second second second second	(mV)		TU)	Purge Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1220		30,44		7.80		4840		1.99		132		555		105	27.13	Ø.
1225		29.87		7.70		4920		1.52		135		358		105	27.10	525
1230		29.59		7.71		4940		0.98		135		248		105	27.10	1050
1235	1235 29.52 7.80 4920 0.83 133 130 105 27.10 1575															
1240	1240 29.52 7.76 4870 1.04 132 30.2 105 27.10 2100															
1245	1245 29,58 7.77 4860 1.03 131 16.7 105 27.10 2625															
1250	1245 29.58 7.77 4860 1.03 131 16.7 105 27.10 2625 1250 29.61 7.76 4860 0.96 129 8.2 105 27.10 3150															
1255		29.80		7.76		4900		0.93		124		0.5		105	27.10	3675
1300		29.84	J	7.76		4870		0,98		25		0.0		105	27.10	4200
1305		29.76		7.76		4870		0.88		126		0.0		105	27.10	4725
0.00		- 10.0				1010		0.00		160		0.0	_	100	41.10	1120
6						-					l					
- *																
									-							
Sample ID:	1)FA	V/V/- 03	5I-201	70407	Duplicate ID:	: NA-				OAIOC Sam	ples/ID: N	1 1			COC Time:	310
		ontainer	1	10 10 1				Material Co					=Clear Glass:		ene; O=Other (
	Materia							Field Decor	tamination:		Field Filtered		COC Number		ene, o-omer (opcony)
Number	Code	Volum	ne Pre	servative	Intended A	nalysis and/o	r Method	Comments:			-0					
		<u> </u>				·		1 5	ulfide	_= 0,	08 mg/	_				
-/	P /	the 4	Jih 7	116	fet -				O							
		700	100/(· 7 -	<u> </u>											
					 			Signature(s):							
INDICATO	PARA	METERS H	AVE STABL	IZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:								
± 0.1 for	pH: :	t 3% for 9	Specific C	onductivi	tv and Te	mperatur	e: ±10	mv for Re	dox Pote	ntial: ±	10% for [)issolved	Oxvaen :	and Turbi	ditv	
BGS -	Below G	Fround Surface	ce	C - Centigrade	е	GS - Groun	d Surface	ma/L - millia	ram/Liter	min - Minut			ina Point		OA - Ouality A	CHESTON

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control



Task Name:	00	n	7 111	. 0 [Ir. 1.14	Λ. Ι	10				-		13	-3535 - 03	IN	ERI, Hender	son, NV Projec
	-4	Hirea	Treatah?	4 Study	rask Manag	er: Hru	HYYOU	NAM	<u> </u>		Task No:	MIZ			Well ID: 🔱	FMW-C	265
Field Sample	ers:	· Lead	4	<u> </u>			11				Recorded by	y: Di Ke	ady		Date: 4 -		
Well Depth (istance AGS (Well Depth	(ft BMP): 3	0.02	Screened/O	pen Interval T	op: / Z 5	.02	(ft BGS)	mp -	(ft BMP
Well Diamet		2	PID/F	ID Readings I	Beneath Inner	Cap (ppm co					Screened/O	pen Interval B	otlom: 3	0.02	(ft Bes) BI		(ft BMP
Pump and T	ubing Ty	pe: (1 ED	Samplet	D; poly	it/bily_		Pump Intake				(ft BGS)				MP Descripti		
Equipment D	Jecon. M	ethod: 3	broket r	MFE.	0		Depth to Wa	ater Bef	ore Pu	mp Installation	n (ft BMP):	26.69		0806		1: G-W-11	fond
	PURGING	T	emp.	F	Н	Spec Co	nductivity	Dis	solve	d Oxygen	Redox	Potential	Tur	bidity	SOCIAL STREET		1
ľ	힐릴		(°C)	(pH !	Units)	(As	/cm)		DO (ng/L)	100 000	(mV)	Th. C. S. S. C. C. C.	TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	S E	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	RE	ADID	ng/L) CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0908	X	24.73		7.38		5.70		6.80	193	1	127		550		100	71.7.	Ø
0913	X	25.49		7.43		5.68			163		- 131		149		100	26.70	
0918	X	25.86		7.44		5.68			1.66		131	[33.6			26.71	500
0923	+	26.11		7.44		5.68									100	26.71	1000
Mo	X	26.19		7.46				5.88			132		9.1		/00	26.71	1500
0933	V	26.24				5.68	-	5.48/	1.55	7	133		1.0	11.00	100	26.71	2000
0940	\ \ \ \			7.46		5.67		5.73	1.53	V	134	~	0.0	1(5)	(00	26.71	2500
\0140	$ - \Delta$	OTAB	1741PV														
						-											
							-									17	
											1				/ (4	10-17	
\												\			DE		
												\					
					— X												
Sample ID:	JEM	1-065	-2017041	0	Duplicate ID:						QA/QC Samp	les (ID)					
Sai	mple Co	ntainer						Mater	rial Cod				Classi CC -	Class Class I		COC Time: ne; O=Other (S	094.
	Materia	1						Field	Decon	lamination:	Y N II	Field Filtered:		COC Number		ne; O=Other (8	Specify)
Number	Code	Volum	ne Pres	servative	Intended A	nalysis and/o	r Method		nents:	- 077°k	, ,,	HOICH.	, ,,	OOC Nulliber	,		-
0 . 0								1		A 1 0	0.00	1,					1
- W A	789 T	Sala	mping	fuze-				1	2	ifide:	0.00 n	35-12					1
131 .3			10					1		_	100	(J
								l		1	5111						1
INDICATOR	PARAI	VETEDS L	HAVE STABLE	ZED MUEN	3.00N0E0	ITIVE DEA	DINOCAST	Sign	ature(s) (Y						
± 0.1 for r	H: 4	3% for	Specific Co	onductivi	by and Tar	DIIVE REA	DINGS ARE	WITH	IN:					National Control		100 P	
BGS -	Below G	round Surfa	Specific Co	C - Centigrade	and let	GS - Groun	d Surface	me/l	r Ked	iox Poten am/Liter	Itial; ±	10% for D	ssolved	Oxvoen a			
		easuring Po	zint (COC - Chain o	of Custody	ID - Identific			nilli Vo		min - Minute mt - milliliter		IP - Measurii T.L - Nephel	ng Point		A - Quality As	

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

Page / of _

NERT, Henderson, NV Project

Task Name:	AP	Arpa T	readoil	Zy Order	Task Manag	ier: Ani	Albert.	lami		Took No.	M/ 1 2	142.43				C
Field Sample	ers:	. Kead	100	10149		ישונים בייי	174400	Warre		Task No: Recorded b		1			FMW-0	OI
Well Depth (Z MP D	listance AGS	(61).		Well Depth	# PMD\s	t = - 1	-				Date: 4.		
Well Diamet		2		ID Readings I		Can Innm co		(ILDIVIP).	10.21		pen Interval T		.21	(fLBG8)	mp	(ft BMP
Pump and T		vne:	DSample		DOTICULAT ITALICA	Oup (ppin c	Pump Intake	Donth:		(ft BGS)	pen Interval E			(flees) &		(ft BMP
Equipment D			bucket						mp Installation		37.7			MP Description		- 1
							-	NAME OF TAXABLE PARTY.		i (ii bixiP):	26.62	Time:	808	GW Disposal	GW-11	fo td
	PURGING		Temp. (°C)		oH Units)	Spec Co	nductivity	Dissolve	d Oxygen	4.00	Potential		bidity	Purge	Depth to	Cum. Vol.
Time		READ	1	READ	CHANGE*	The same of the same of	The same of the sa			PLUS NOT A VIDE	(mV)		TU)	Rate	Water	Purged
Time					CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1048	1	27:0		7.80		5.44 5.45		102/15		147		46.6		00	26.64	Ø
1053		27.18		7.74				0.44 1.58		147		23.9		100	26.66	500
1058	X	27.32		7.75		5.45		0.16/0.99		143		5.2		100	26.66	1000
1103	X.	27.39		7.70		5.46		0.14/1.00		144		0.0	,	100		
1108 × 27.45 7.76 5.46 000/0.98 140 00 00 (45) 100 26.66 2000																
1			برايق ايجازيون													
/_			-													\
/				<u> </u>									7			
/_							1						0			
·	-		-				\					- 4/				$\overline{}$
				-/								X				
		ļ										4				
														-		
Sample ID:	UFM	M-06I	-201704	10	Duplicate ID:	VEMN	-06T-	201704	110-FD	QA/QC Sam	ples/ID:			23 -0	COC Time: [116
Sa		ontainer			1			Material Co	des: VOA = 40	0 ml glass via	ıl; AG =Ambei	Glass; CG =	Clear Glass;	PE=polyethyle	ne; O=Other (Specify)
Manakasa	Mater							Field Decor	tamination:	Y N	Field Filtered:	ΥN	COC Number			<u> </u>
Number	Code	e i Voi	urne Pre	servative	Intended A	Analysis and/o	or Method	Comments:								
Λη.Λ	4	- 0		7				<.	10%	n. 01	· 11 .					
AP Are	1 k	5 60	nothe (Suze					olfite:							
										$\nearrow \downarrow \chi$	9					
		1						Signature(el·	\neq X						
INDICATOR	? PAR/	AMETERS	HAVE STABL	IZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN	r- (1			_ 10_		
± 0.1 for	эН:	± 3% fo	r Specific C	onductivi	ty and Te	mperatur	e: ±10	my for Re	dox Poter	ntial: ±	10% for D	issolved	Oxygen :	nd Turbid	lity	
865 -	R610M	Ground Sur	race	C - Centigrade	8	GS - Groun	nd Surface	mg/L - millig	ram/Liter	min - Minut		/IP - Measuri			QA - Quality As	SIRANCE
BMP -	Relow	Measuring I	oint	COC - Chain	of Custody	ID - Identifi	cation	mV - milli Vo	alts	ml - millilite			ometric Units		QC - Quality Co	

Project Name:	NERT T	ask K01 - Soil Flus	shing IRM Date: 6/19/	17
\ddress:		Henderson, NV 89		
echnician:	Jesse Bunk	THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.		composition
	100°F clear			
lonitoring We	ells			
Well iD	Depth to Water (ft btoc)	Total Depth of	Notes (well condition, etc.)	. 49
		(ft btoc)	PLOT 1 (NORTH)	
jection Wells	3		(DO) (NORTH)	
UFIW-01S	26.75	0752	*	· •
UFIW-011	7.7.06	0753	W	avi saki
UFIW-01D UFIW-02S	76.24	0754	*	
UFIW-02I	26.31	0757	4	1, .
UFIW-02D	46.30	0758		
UFIW-03S	26,32	07.59	4	
UFIW-03I	26.39	0800	*	
UFIW-03D	26,44	0801		
UFIW-04S UFIW-04I	7.6.67	0803	7	
UFIW-04D	26.61	0804	**	
lonitoring We		0003		
UFMW-01S	28.08	0720		
UFMW-01I	28.55	0725		- 100
UFMW-01D	28.91	0733		
UFMW-02S	27.55	0827		
UFMW-02I	28.50	0825		
UFMW-02D UFMW-03S	28.68	0826		
UFMW-031	26.50	0745		
UFMW-03D	26.78	0744		
xtraction We				
E1-1	42.71	8739		
E1-2	33.85	0940		
E1-3	43.66	0741	PLOTA (COUTIN	
jection Wells			PLOT 2 (SOUTH)	
UFIW-05S	<u> </u>			
UFIW-051				
UFIW-05D				
UFIW-06S				
UFIW-06I				
UFIW-06D UFIW-07S				
UFIW-071				
UFIW-07D				
UFIW-08S				
UFIW-08I				
UFIW-08D				
onitoring We UFMW-04S	lis 26.70	Aceth		
UFMW-041		0814		
UFMW-04D	26.73	0815		
UFMW-05S	26,94	0817		
	26.83	0818		
	26.72	0814		nas su continu
UFMW-05D	7 4 7 7	0826		
UFMW-051 UFMW-05D UFMW-06S	26.67			
UFMW-05D UFMW-06S UFMW-061	26.60	0821		
UFMW-05D UFMW-06S UFMW-06I UFMW-06D	26.60 26.65	0822		
UFMW-05D UFMW-06S UFMW-06I UFMW-06D traction Wel	26.60 26.65	0822		
UFMW-05D UFMW-06S UFMW-06I UFMW-06D traction Well E2-1	26.65 26.65 s	0822		
UFMW-05D UFMW-06S UFMW-06I UFMW-06D ttraction Wel	26.60 26.65 s 25.85 26.09	0808		
UFMW-05D UFMW-06S UFMW-06I UFMW-06D traction Wel E2-1 E2-2	26.65 26.65 s	0822		

TE TETRA TECH



Page ____ of ____

NERT, Henderson, NV Project

	sk Name: AP Area Treatgle 177 Andy Task Manager: G. Roemer Task No: M13 Well ID: UFMW-015																	
Task Name:	A	PA	rea Tra	atali7724	Study	Task Manag	er: G.Re	emer				Task No:	MIS			Well ID: //	FMW-C	115
Field Sample		D	Keadi									Recorded b		ady		Date:	-19-17	
Well Depth (1	t BGS	S):		MP Dist	ance AGS (f	1):	-	Well Depth (ft BMP):	7.9	.56	Screened/O	pen Interval T		, 4	(ft BGS)	1111	(ft BMP)
Well Diamete			2			eneath Inner			_			Screened/O	pen Interval B	lottom:	27	(ft BGS)		(ft BMP)
Pump and Tu	bing	Тур	E QED S	myle Pro (L	ladder)	: Aly t	Uhna_	Pump Intake	Depth:	_		(ft BGS)	24.	T	(ft BMP)	MP Description	on: TOO	
Equipment D	econ	. Me	hod: 3	suchet riv	ise w/			Depth to Wa	ter Befo	re Pum	p Installatio	n (ft BMP):	28.08	Time: 🕝	720	GW Disposal:	6-W-11	18 nd
				emp.	p			nductivity	Dicc	alved	Oxygen	Paday	Potential	Tuel	bidity		D. H.	O 1/-1
	18	Ž		*C)	(pH U		Mus			00.(m	a/L)	The same particular in	(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	AME	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA	64	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0823	X	6)	30.[3]		6.97	Shaperon Value and	3.61	Christian and American	1.39/			192				100	28.14	Ø
0828	X		27.97				3.57		177			172		4.66	<u> </u>	100	28.22	500
			27.10		7.10							· · · · · · · · · · · · · · · · · · ·				1	28.25	1000
	X	-			7.13		3.53		0.42			167		1.84		100		
0838	X		27.02		7.15		3.53		0.29			164		1.28		100	28.27	2000
0843 \ 76.98 7.16 3.55 0.27/0.34 163 0.75 100 28.28 2500																		
0848	0848 × 26.96 / 7.16 / 3.55 / 0.26/0.32 / 163 / 0.48 / 100 28.28 3000																	
0850																		
1	0850 X STABILIZATION																	
																6.19	, D	
																(:	11/	
		1					-									TEP		
-	\vdash	-																
$\overline{}$	\vdash	-																
-+		\rightarrow								1					-			
		-													1			
Sample ID:				-2017-06	19	Duplicate ID			Texas .	7966	88553	QA/QC San					COC Time: C	
Sa	mple	e Co	ntainer										·		7	s; PE=polyethyl	ene; O=Other ((Specity)
Number		ahn ebo	Volu	ma Proc	ervative	Intended /	Analysis and/	or Mathod	Comm		amination:	YN	Field Filtered	; Y N	COC Number	er.		
MONIDO		oue	Yolu	1163	CIVALIVE	WileHoed /	andiyata dilur	oi Melilou	Comm			10.4.						6
				_					1	106	or: C	lear	101					į,
API	Tre	a	Τ. ς., ι	Sample	SP#	-			1				01/					
				1								,)-	D I					
			1						Sign	ature(s):(1/	11					
*INDICATO	R PA	RAI	METERS I	HAVE STABLI	ZED WHEN	3 CONSE	CUTIVE RE	ADINGS AR	E WITH	IIN:			0					
± 0.1 for	pH;	- :	: 3% for	Specific Co	onductiv	ty and Te	emperatu	re; ± 10	mv fo	r Rec	dox Pote	ential: :	± 10% for	<u>Dissolve</u>	d Oxygen	and Turbi	dity	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units



NERT, Henderson, NV Project

										-				• • • • • • • • • • • • • • • • • • • •	,	,
Task Name:	APA	reatre	atability.	Study	Task Manag	er: <i>G</i> R	pemer	_		Task No:	M13			Well ID: UF	MN -013	E
Field Sample	rs: D	Kendy		7						Recorded b	7 7	adu		Date: 4	19-17	
Well Depth (f	t BGS):	/	MP Di	stance AGS (ft): ——		Well Depth (ft BMP):	39.52	Screened/O	pen Interval T		34	(ft BGS)	++++ <u>-</u>	(ft BMP)
Well Diamete	r (in):	7-1				Cap (ppm ci			J-1:	-	pen Interval B	_	39	(ft BGS)		(ft BMP)
Pump and Tu	bing Ty	pe: Orbs	PID/FI	- Wadde) ; poly	-	Pump Intake	Depth:		(ft BGS)	36		(ft BMP)	MP Description	on: TOC	(,
Equipment D	econ. N	lethod:	dicated	PUMP -	+ tubine	7	-		ump Installatio		28.55		0725	GW Disposal		Pont
	_													CTT Biopool	G - 1/	
	PURGING	To To	emp. (°C)		H Jnits)	Spec Co Mus	nductivity	2775-773	ed Oxygen	The second secon	Potential		oidity	Purge	Depth to	Cum. Vol.
	<u>B</u>	DEAD		100				You DO	A TAXABLE PARTY OF THE PARTY OF		(mV)	300	TU)	Rate (ml/min)	Water	Purged
Time	김영		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ		READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0925	X	31.23		7.45		4.03		0.97/3.1	3	154		9.39		100	28.53	9
0930	X	28.99		7.47		4.01		0.62/11		149		6.59		100	28.57	500
0935	X	27.97		142		4.01		0.32/0.		146		4.26		100	28.51	1000
	0940 × 27.91 7.48 3.99 0.20/0.43 143 2.69 100 28.60 1500															
)945 X 28.08 7.49 3.99 0.75 0.38 142 1.48 100 28.60 7000															
	0945 X 28.08 7.49 3.99 0.75 0.39 142 1.48 100 28.60 7000 0950 X 28.35 7.49 3.99 0.27 0.36 142 0.80 100 28.60 2500															
0950	0950 X 2835 / 7.49 / 3.99 / 0.27/0.34 / 142 / 0.80 / 100 28.60 2500															
	9950 X 2835 / 7.49 3.99 0.27/0.36 142 0.80 100 28.60 2500 1955 X 28.38 7.49 4.00 0.28/0.38 142 0.69 100 28.60 3000															
000		STAFE	11-12AT	57												/
1																
																./
										-			-		ر.	
									+						1.67	
									-						DKY	
		-							1					4		
																.]
Sample ID:	UFN	W-013	C-2017	0619	Duplicate ID	_	_			QA/QC Sam	ples/ID: -				COC Time:	000
Sa	mple C	ontainer						Material C	odes: VOA = 4	0 ml glass vi	al; AG =Ambe	r Glass; CG	=Clear Glass	PE=polyethyle	ene; O=Other	(Specify)
	Code							Field Deco	ontamination:	Y N	Field Filtered:	YN	COC Numbe	r.		•
Number	Code	Volu	me Pre	servative	Intended A	nalysis and/	or Method	Comments								
									Color	clear						- 1
MO	A		5 - 5		_			1	Cole		. 1					- 1
_[]	re	a).	7. 9a	MPlih	1- H			1	-			-				
						····		1		1)1						I
INDICATO	1045	MAETERS:	IANE OTAGE	(360)	10.0001055	VIII (E SE	15,155,15	Signature	e(s):	V						
			HAVE STABL						adau D		1000	.	1.05504			150
			Specific C								100.00				34 - 3	
- 6טם	Delow	Ground Surfa	1CE	C - Centigrad	16	- 65 - 6MI	nd Surface	mo/L - mil	ioram/Liter	min - Mint	116	MP - Measur	ana Point	1	OA - Quality A	ssurance

BMP - Below Measuring Point

COC - Chain of Custody ID - Identification

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control



OWE	OW	0001	IAIMIAIA	TEO C		1110	
OW FL	.UW	GHUU	NUVVA	ieh s	AMPL	ING .	LUG

Page __ of __

NERT, Henderson, NV Project

	100			- 388					100							,	
Task Name:	AP A	rea Tree	Hability,	Study	Task Manag	er: (-, R	remer			-	Task No:	M13			Well ID: U	MW-0	ID
Field Sample	ers: D.	Keady									Recorded by	y D. Ke	adu		Date: 6-	9.17	
Well Depth (t BGS):	- 1	MP Dis	stance AGS	(ft): —		Well Depth (ft BMP):	49.2	5		pen Interval 1		34	(ft BGS)		(ft BMP)
Well Diamete			PID/FI	D Readings	Beneath Inner	Сар (ррт с	ge akb):				Screened/O	pen Interval E	lottom:	49	(ft BGS)		(ft BMP)
Pump and To	ubing Ty	pe: Delica	ated blade	er pumi	+ 100 4+	vang	Pump Intake	Depth:	36.	5	(ft BGS)		-	(ft BMP)	MP Description	on: TOC	· · · · ·
Equipment D	econ. M	ethod: De	diated	bright 4	thouse	_ 0	Depth to Wa	ter Befor	e Pump Ins	stallatio	n (ft BMP):	28.91	Time:		GW Disposal	GW-//	Pond
(mine till a	(G G	To	emp.		Н	Spec Co	nductivity	Disso	lved Ox	vaen	Redoy I	Potential		idity	Duran	D	O V.1
	P S		(°C)		Units)	PT(#S			9.(mg/L		Salar Salar	(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA		ANGE'	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
023	X	34.52		7.51		5.64		2.45/	3.63		145		4,93		100	28.84	Ø
1028	X	29.69		7.53		5.39		0.741			148		0.15		100	28.85	<00
1033	X	28.93		7.55		5.35		050/		-	148		0.32		100	78.85) DoD
1038	X	28.82		7.56		5.33		0.39			148	1	0.00		100	28.85	1500
1043 × 28.68 7.55 5.33 034/0.65 149 0.00 100 28.85 2000																	
1048 X 31.15 7.56 5.15 0.31/1054 147 0.00 100 28.85 1500																	
1058	X	29.91		7.54 7.54				וטקוט	0.18				0.00		100	28-85	3000
	X			1		5.36		0.29	0.45		148	-	Ø100		100	28.85	3500
100	X	21BR	ILIZAT	1014					-								
																	
			:							-							
									_				-			- 1	1/
																6.19.1	
															d		
			-20170	619	Duplicate ID:		9	_			QA/QC Sam	• 400					100
Sa	mple C	ontainer						-								ene; O=Other (Specify)
Number	Code	Volum	ma Pro	servative	Intended A	nalysis and/	or Mathod	-	econtamin	ation:	YN	Field Filtered	: Y N	COC Numbe	er:		
tautibei	Code	Y Ottal	110	3GI VILLIVE	Intended A	ilialysis allul	OI MEDIOU	Comm	enis:								- 1
ADDT		^			7	•			color	r: (lear						
NERT	-HPP	Mre	(T. S. &	amph	ng d	e/-				-		01	1				1
					· ·			1)						
									ture(s):			1					
			HAVE STABL														
		± 3% for Smund Surfa	Specific C												and Turbi	dity	
- വേ	DEIOW L	BINUG DINUUK	ICH !	u - cenimaa	fe .	145 - (400)	na Sudace	$m\alpha / l = 1$	miliaram/l	Itor	min - Minu	to	MD . Moscuri	na Doint		A Overline As	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surfaction

mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units



Page _ of _

NERT, Henderson, NV Project

Took Name	10	1. 14	- 1 1 11	C: 1	T1 54			32	0.0	<u> </u>						SOII, INV PTOJECI
Task Ivallie.	HIL	med II	estability	y Study	lask Manag	er: G.K	oemer			Task No:	M13			Well ID:	PMW-0	2 S
Field Sampl	ers:	Keady	/	/ /						Recorded b	y: D.K.	eady		Date: 6	19.17	
Well Depth				stance AGS (Well Depth ((tt BMP): 7	9.19	Screened/O	pen Interval T	Гор:	24	(ft BGS)		(ft BMP)
Well Diamel			PID/FI	D Readings (eneath Inner	Cap (ppm cg	je akb):			Screened/O)pen Interval E	Bottom:	2.1	(ft BGS)		(ft BMP)
Pump and T	ubing T	pe: QE	Single	13 (b) ad	10): pok	thone	Pump Intake	Depth:	ZG.5	(LEGS)	-		(ft BMP)	MP Descripti	on: TO	
Equipment (Decon. N	lethod: 3	aucket 1	ringe w	Ligun	X	Depth to Wa		ump Installatio	n (ft BMP):	27.55	Time:	0827	GW Disposa		
	/m (C	TO SHARE THE PARTY OF THE PARTY	emp.		Н	-	nductivity	Diecolye	ed Oxygen	Dodovi	Potential	_				
	N 2		(°C)		Jnits)	n Ws		DISSOIT DO		The second section of the section of the sect	(mV)		bidity TU)	Purge	Depth to	Cum. Vol.
Time	PURGING SAMPI ING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Rate (ml/min)	(ft BMP)	Purged (ml)
1157	X	37.89		7:33	32					_	CHINA		OTIMITAL	The promote day of		
	X					2.58		2.09	-	153	-	34.3		100	27.64	Ø
1202	***	32.44		7.29	_	2.54		1.19	-	161	-	14.8		100	27.65	500
1207	X Sus		COMPA						-		ļ					
	1218 X AIR COMPRESTOR WORKING AGAIN.															
1220	1220 X 3215 7.30 2.55 0.81 166 2.95 100 27.65 1000															
1225	1225 X 29.96 7.32 2.52 0.72/ 166 1.02 100 27.66 1500															
1230	1225 X 29.76 7.52 2.52 0.72/ 166 1.02 100 27.66 1500 1230 X 28.76 7.30 2.53 0.29/ 168 0.00 100 27.66 2000															
1235	X	27.44		7.33		7.52	-	0.27/		1/ 9		0.00	-			
1240	X	27.13		7.32		2.52		0.25		169	1	0.00	1	100	27.67	2500
	X		11120	-		2.70		w. <i>4</i> 5		16	-	0.00	-	100	27.67	3 000
1245		01716	1 LIZAT	NO				<u> </u>								
														At .		
														₩	6./9./7	
				-											11./7	
	V															
Sample ID:	UFN	1W-02	25-2017	0419	Duplicate ID:	-		53-45.7		QA/QC Sam	ples/ID: -		9		COC Time:	1245
Sa	mple C	ontainer		and in		(1)		Material Co	odes: VOA = 4	0 ml glass via	al; AG =Ambe	r Glass; CG	=Clear Glass;	PE=polyethyl	ene; O=Other (Specify)
	Code							Field Deco			Field Filtered		COC Numbe			
Number	Code	Volur	ne Pres	servative	Intended A	nalysis and/o	r Method	Comments	:	200	371367					
		_						1 /	alor: C	lear						
NER	ρ	R Are	a 7.5.	COMOS	. h . A	Set		1 6	olor: C	70-41	- (1				
7.0		131 6	7 7 7 7 7	المالية	1119	061				1	-01	1				
					<u> </u>			Cignotura	(a).	1)	1/					l:
INDICATO	PARA	METERS	IAVE STABLI	IZED WHEN	3 CONSEC	LITIVE REA	NDINGS AD	Signature	(0)	0/		/				
± 0.1 for	pH:	± 3% for	Specific C	onductivi	tv and Te	mperatur	e: +10	my for P	eday Pate	ntial: ±	. 10% for 1	Diecoluca	1 Ovi	and Trutt	alta	
BGS -	Below (Ground Surfa	ce (C - Centiorad	9	GS - Groun	d Surface	mo/l - millio	remil iter	min Minut	. 10/0 IUI L	JISSUIVEC		and Lurbi	CITY	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surfaction

mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

	-		
Page	1	of	

NERT, Henderson, NV Project

	k Name: Af Area Treatability Study Task Manager: G. Roemer Task No: M13 Well ID: UPMW-02I d Samplers: D. Keady Date: 6.19.17																
Task Name:	HY F	irea in	cat ability	brudy	l ask Manag	er: G.K	ormer				Task No:	M13_)2I
Field Sample	ers: D	. Kead	4 /								Recorded by	" Dike	adu		Date: 6.	19.17	
Well Depth (ft BGS):	31		stance AGS (_	Well Depth (it BMP):	_		Screened/O	pen Interval T	op: /	34	(ft BGS)		(ft BMP)
Well Diamet			PID/FII	D Readings E	Beneath Inner	Cap (ppm cg	e akb):	_			Screened/O	pen Interval B	ottom:	31	(ft BGS)		(ft BMP)
Pump and T	ubing Typ	e: Degio	ated 6 lad	der pun	10 + ml	-tolake	Pump Intake	Depth:	-		(ft BGS)	36.	5	(ft BMP)	MP Description	on: TOC	
Equipment C	Decon. Me	ethod: De	i cated	punos			Depth to Wa	ter Befor	re Pur	np Installation		28.50	Time:	0825	GW Disposal		ford
	Total Control				-		-				1					1300	To- Q
	PURGING		emp. (*C)		H U Units)	Spec Cor	nductivity			Oxygen	The second secon	otential		oidity	Purge	Depth to	Cum. Vol.
	8 8	101			200000000000000000000000000000000000000		And street county	Hory		And the second second	Secure Contract of the security	(mV)		TU)	Rate	Water	Purged
Time	문양	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA		CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1324	X	44.26		7.38		4.88		4.07	623		147		605		100	28.50	Ø
1329	X	44.24		7.33	[4.77		0.53	2.12		148		719		100	28.51	500
1334	X	43.27		7.36		4.78		0.50	1.02		146		830		100	28.60	1000
1339	X	44.19		7.35		4.76		0.56	076				704		100	29.62	1200
	X	43.72		7.34		4.75		065		-	146		461		100	78.62	2000
1349 X 43.29 7.37 4.77 0.72/0.62 149 299 100 28.67 7500 1354 X 43.31 7.36 4.76 0.77/0.04 15) 163 100 28.67 5000																	
1354	354 × 4331 736 4.76 0.746.4 15) 163 100 21.63 5000																
	1359 X 44.58 7.36 4.77 0.82/0.71 152 110 100 28.73 3500																
1404	X	43.84		7.37		4.77		0.86	0.73		153		90.			28.63	4000
1409	X	43.21		7.37		4.77		0.87			155		589		100	28.43	4000
	X	43.08		7.58		4.75		0.89			156		39.8		100	78.63	5000
1414	X	43.67	/	7:37	/	4.77		0.87) /	157		36.3		100	ZP.63	5500
1424	X	43.11		7.37		4.77		0.84	0.1		159		34.3	V	100	78.63	6000
1430	X		1617-41			1-1-1		-			12-1			-		DE	1917
	4																
Sample ID:	UFM	J-02I	-20170	۱۹	Duplicate ID:			SIT.			QA/QC Sam	ples/ID: -	4			COC Time:	1430
	ample Co						NE DESIGNATION	Materi	al Cod				Glass: CG	=Clear Glass:		ene; O=Other	
	Code									amination:		Field Filtered:		COC Numbe			(
Number	Code	Volun	ne Pre	servative	Intended A	nalysis and/o	or Method	Comm		31.2		77				1.60	
								1	1	olor : 1	cloudy.	whiti	h				
רטאו	- 200				_	-		1	U.		t,						
NER		Hrea	T.S. 8	amph)	19 J1	3+						~ 11	27				
				•	0						1) \	1				
									ature(s):	1)~	< \					
			IAVE STABL														
± 0.1 for	pH; :	± 3% for	Specific C	onductivi	ity and Te	mperatur	e; ±10	mv fo	r Red	dox Pote	ntial; ±	10% for [Dissolved	Oxygen	and Turbi	dity	1
		chu2 bauar		C - Continged			d Curlona				_0_0						2772 PT

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units





NERT, Henderson, NV Project

						717 7 20	TI GIT	J 0 1 1 1	2111	71.511	<u> </u>		200	_		7	
Task Name:	API	Grea Ti	reatabilit	y Study	Task Manag	er: (5. Ro	emer				Task No:	MI3			-	JEMM-	
Field Sample				<i> </i>							Recorded b	by: D.K.	ady			0.20.17	
Well Depth (f		40	MP Dis	stance AGS (1	t): 🚤		Well Depth (ft BMP):			Screened/C	Open Interval T	op: /	47	(ft BGS)		(ft BMP)
Well Diamete	er (in):	2	PID/FII	D Readings B	eneath Inner	Cap (ppm co	je akb): 🕒				Screened/C	Open Interval B	ottom:	49	(ft BGS)		(ft BMP)
Pump and Tu	bing Typ	e: Dedic	ded bla	deer pu	met poly	theky_	Pump Intake	Depth:			(ft BGS)	44.5		(ft BMP)	MP Description		
Equipment D	econ. Me	thod: De	licated N	mp+ th	149	0	Depth to Wa	ter Befor	e Pum	np Installatio	n (ft BMP):	28.68	Time: 🗷	824 (411-13)	GW Disposal	: cw-11	Pond
	- C	Te	mp.	р	н	Spec Co	nductivity	Disso	olved	Oxygen	Redox	Potential	Turk	oidity	Purge	Depth to	Cum. Vol.
	S S		·C)	(pH l		MyGS			Q (m		ORE	P (mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*			CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0735	X	33.45		7.45		6.99		4.24/	4.68		150		38.7		100	29.10	Ø
0740	X	31.18		7,55		6.20		0.96		•	149		17.0		100	29.13	500
0745	X	30.57		7.54		5.94		0.45			149		1.13		100	29.14	000
0750	V	30.69		7.54	ļ	5.89	-	0.28/	_		149		0.00		100	29.17	(500
0755	Y	30.89		7.54		5.87		0.24	-		149		0.00		100	21.17	ZA 00
0800 × 30.88 7.54 5.87 0.16/0.96 148 0.00 100 21.17 2500																	
	9805 X 31.09 7.53 5.86 0.18/0.82 149 0.00 100 29.17 3000																
	0810 X 31.34 7,52 5.86 0.18 0.78 149 0.00 100 29.17 3500																
0872	1	STAS	IVIZATIO	20			-	-	-		-						
									-		-	-			-	2	
											-					0:12	
											ļ			+	Carlo		
											1						
	1									_							
Sample ID:	UFM	W-020	1-24170	620	Duplicate II): <u> </u>	_	50			QA/QC Sa					COC Time:	
		ontainer			14									_		lene; O=Other	(Specify)
	Code									tamination:	Y N	Field Filtered	1: Y N	COC Number	er:		
Number	Code	Volu	me Pre	eservative	Intended	Analysis and	or Method	Comr	nents:								
	-				-				col	or: (lear						
Nel	T	AP 1	20 7	.s. Sa	molin	Car			C-1	257	/	\sim 1					
1461	17	, yu /.	real	J. 3*	1	_ 0(/				77	1-1) \	1				
								Sian	alure(s):	1			2-78	0.20		
INDICATO	R PAR	METERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF								990 B:	- NFE	
± 0.1 for	pH;	± 3% for	Specific (Conductiv	ity and T	emperatu	ıre; ± 10	mv fo	or Re	dox Pot	ential:	± 10% for	Dissolve	d Oxyger	and Turb	idity	
														uring Point		OA - Quality A	Assurance

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surfact ID - Identification mg/L - milligram/Lit mV - milli Volts min • Minute ml • milliliter MP - Measuring Point NTU - Nephelometric Units





LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project Task Name: AP Area Treatal : By Study Task Manager: (r. Kormer Task No: M(3 Well ID: UFMW-005 Field Samplers: D. Leady Date: 6-19-17 Recorded by: D. Kealer Well Depth (ft BGS): 🔔 MP Distance AGS (ft): Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) (ft BMP) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) (ft BMP) Pump and Tubing Type: Pump Intake Depth: (ft BGS) (ft BMP) MP Description: Equipment Decon, Method: Depth to Water Before Pump Installation (ft BMP): ----Time: GW Disposal: PURGING Temp. pH **Spec Conductivity Dissolved Oxygen Redox Potential Turbidity** Purge Depth to Cum. Vol. (.C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* READ CHANGE* Time READ CHANGE* (ml/min) (ft BMP) READ CHANGE* READ CHANGE* (m1) WELL DRY; UNABLE TO MONITOR SAMPLE. Sample ID: **Duplicate ID:** QA/QC Samples/ID: **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Code Number Volume Code Preservative Intended Analysis and/or Method Comments: Har 611/ Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



BMP - Below Measuring Point

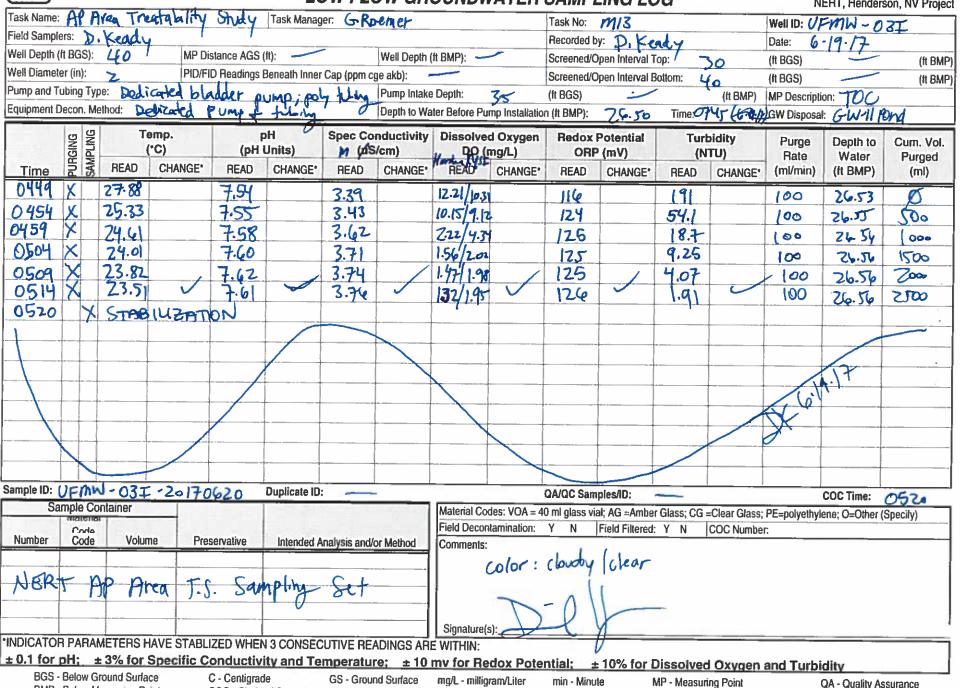
COC - Chain of Custody

ID - Identification

Page 1 of 1

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project



mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control



TETRA TECH

Page 1 of 1

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

	~~	TA	-	24 6						7.5					***		1011, 111 1 10JEC
Task Name	HY	Area	Treatal	ACTION .	Jask Manag	er: G	Ro emer	3 37			Task No:	m	3		Well ID: (IPMW-0	3D
Field Sampl	ers: D	Ken	Ay		-	4.0 3.0m - 11					Recorded b	y: D.	Kendy		Date: 6	11.05.	
Well Depth		50		stance AGS (ft):		Well Depth (II BMP):	_		Screened/C	pen Interval	Top:	45-	(It BGS)		(It BMP)
Well Diamet		2	PID/FII	D Readings 6	Beneath Inner	Cap (ppm c	je akb):		_		Screened/C	pen Interval E	Bottom:	10	(II BGS)	-	(ft BMP)
Pump and T	ubing Typ	e: Deli	afed blue	der own	0 : dalu :	hlum-	Pump Intake	Depth:	43.		(ft BGS)			(It BMP)	MP Descripti	on: Toc	(112-111)
Equipment (Decon. Me	thod:	ebreted	pund		0	Depth to Wa		Principal or 197			76.71	Time:	AND RESIDENCE OF THE PARTY OF T	GW Disposa	-	en l
							-	-							CVI DISPOSO	G-VVII	T W G
	PURGING		emp. 'C)		H Units)	Spec Cor Mus	nductivity			Oxygen	ı	Potential		bidity	Purge	Depth to	Cum. Vol.
	8 2	READ					T	Hank				P (mV)		TU)	Rate	Water	Purged
Time			CHANGE*	READ	CHANGE*	READ	CHANGE*	_		CHANGE*	READ	CHANGE*	READ	CHANGE.	(ml/min)	(ILBMP)	(ml)
0558	X	24.99		774		4.80		1.66	181		150		9.36		100	27.15	Ø
0603	X	24.18		775		4.78		0.48			151		1.78		100	27:15	200
8090	7	24.15		775		4.78		0.19	_		151	1	0.33		100	7.15	000
0613	Site		OLD TO		70 Le		Sour		- 4		121		0.25		100	67.10	_
0637	-							1000	1			-		-			1
06447	\$		51 PUR	7.70		11 00		124	fan		LHa		0.04	-		27.25	
06842		26.91			-	4.80		1.20	_		142	1	0.04		COO		1250
and the same of the same	K	76.03	1	7.13		4.82		0.35		- 1	142	1	0.00	/	(00)	27.12	2000
0652	X	25.84		7-73		4.79		0.18	05		143	/	0.00	V	100	27.15	2500
0700	X	STIPLE	ILIZPIT O	4											100	NO DA AM	
1									1								
									+		1						
	111							-	+	-		1					
									-			1					
-			-	/											N	-5	
															SA	6.20.17	- /
Ы	1								1								
Sample ID:	UPP	1W-03	5D - 2017	0620	Duplicate ID	:			- CONTRACTOR OF THE CONTRACTOR		QA/QC Sam	ples/ID:	_			COC Time:	
Sa	imple Co	nlainer						Materi	al Code	es: VOA = 4	0 ml glass vi	al, AG =Ambe	r Glass; CG	=Clear Glass;	PE=polyethyl	ene; O=Other (Specify)
	Code							Field C	econta	mination:	Y N	Field Filtered	: Y N	COC Numbe			
Number	Code	Volun	ne Pres	ervalive	Intended /	Analysis and/	or Method	Comm	ents:	- 55 65						30 20 71 22 3	
		-			i o ori				- 1		lee-						1
	1	-						1	(0	or : C	CAT						- 1
NE	K	APP	hea T.	Sal	ne like	-Cet		1		*****	0	-1					
140		13			10	9.61		1		1	1	()					
UNIDIOATO	DADA	ACTEDO	14145 051011						lure(s):		4	d =					
			AVE STABL								L					No. of the last	
± 0.1 10f	Poloni C	round Suda	Specific Co	Continue	tv and Te	mperatur	re; ± 10	mv fo	Red	lox Pote	ntial; ±	10% for			and Turbi	dity	
DU33	· DEIUW G	i vuilu aulia	LB (Genuarao	Ne.	15S - 15MH	ia Simace	mag.	millines	ım# ilar	min . Lline:	do	MAD Manage	in a Daint		04 0	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surf ID - Identification mg/L · milligram/Li mV · milli Votts

min - Minute ml - mitiliter MP - Measuring Point NTU - Nephelometric Units



Page 1 of 1

LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

		A						~ ~	***************************************		THE PARTY	<i>-</i>		IAI	En I, neilloeit	Son, INV Project
Task Name:	AP	Area To	reatabil)	Ay Shedy	Task Manag	jer: 🕒 🖟	bemer-			Task No:	M13			Well ID: []	PMW-C	545
Field Sample	ers: D.	Keady								Recorded b		ady			.20.1	
Well Depth (MP Di	stance AGS (ft):		Well Depth (ft BMP):			pen Interval 1		24	(ft BGS)		(ft BMP)
Well Diamet	er (in):	2	PID/FI	ID Readings E	Beneath Inner	Cap (ppm co	ge akb):				pen Interval E	_ ·	7.9	(It BGS)		(ft BMP)
Pump and T	ubing Ty	pe: BED	Sample Pr	* (bladde	(); polyt	shina -	Pump Intake	Depth:	76.5	(ft BGS)		_	(ft BMP)	MP Description	on: TAC	(11 2)111 /
Equipment D	econ. M		butet in			0	+		Pump Installatio	-	78.70	Time: O		GW Disposal		Bond
- 1	len		76	Service -		0						-		тетт віврова		
3 1	PURGING		emp. (*C)		H Units)	M Kis	nductivity		ved Oxygen	Till designation with a	Potential (mV)		bidity	Purge	Depth to	Cum. Vol.
T1	E E	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Harty	(mg/L)		1		TU)	Rate	Water	Purged
Time			UIMIGE		CHANGE		CHANGE			READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0933	X	31.63	-	7.50		4.67		167/	81	149		23.6		100	26.74	Ø
0938	X	28.98		7.44		4.51		0.69/1		156		9.36		[00	26.80	500
0943	X	28.14		7.44		4.37		0.41/0	1.73	158		3.58		100	26.86	1,000
0948	X	27.86)	7.44		4.28		0.28/).(7	159		1.48	-	100	26.92	(500
0953	X	27.71	,	7.44	1	4.24		0.26/0						100		
0958	0958 × 27.63 × 7.43 × 4.22 × 0.24/04 × 160 × 0.00 × 100 26.95 2500															
	158 X 2763 V 7.43 V 4.22 0.24/0.41 V 160 V 0.00 100 26.75 2500 000 X STABLUTZATION															
1000																
																
																,
									_							
												-				
													7	/5		
Sample ID:	رم سول ر	1 1	C - 1-		D !! !D							9-1	- 6.0	17		
	mple C	ontainer	5-2-170	7620	Duplicate ID			10.0 - 1 - 1 - 1		QA/QC Sam	•				COC Time:	(D00
00	materia	ontainer					387		Codes: VOA = 4						ene; O=Other (Specify)
Number	Code		me Pre	servative	Intended A	malysis and/o	or Mathod	Comme	contamination:	Y N	Field Filtered	: Y N	COC Numbe	r:		
	0000		- 110	1	macrided P	anarysis andre	or rection									- 1
ALTET	Δ40	^						1	Color = CH	ear						- 1
NEW	171	trea	T.S. 8	Somply	ly &	-				_	1					
					1				<u></u>	T	1/1					1
								Signatu	re(s):	1	2 7					- 1
			HAVE STABL					E WITHIN	l: C	7	()					
									Redox Pote	ntial; ±	: 10% for I	Dissolved	Oxygen	and Turbi	ditv	
BGS -	Below G	Fround Surfa	ice	C - Centigrad	le				illioram/Liter				ing Point		OA Ouolibe Ar	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surfaction

mg/L - milligram/Lit mV - milli Volts min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

$\underline{\underline{}}$					L	JVV FL	JW GH	OUN	UWAIEK	SAMP	LING LO)G		N	ERT, Hender	son, NV Project
Task Name:		Area I	reatabilit	1 Stray	Task Manag	per: (T.	Coemer			Task No:	MIS			Well ID: U	FMW-0	4I :
Field Sampl		. Kead		/ !						Recorded b	y: D-K	eady		Date: 6	-20-17	<u> </u>
Well Depth (39		stance AGS		_	Well Depth	(ft BMP):		Screened/C	pen Interval T		34	(ft BGS)	-	(ft BMP)
Well Diamet		て `	PID/FI	D Readings I	Beneath Inner	Cap (ppm c	ge akb):			Screened/C)pen Interval E	Bottom:	39	(ft BGS)		(ft BMP)
Pump and T	ubing Typ	e: OED	Sample P	ro (Isladde	r); pdy t	LLing	Pump Intake	e Depth:	76.0	(ft BGS)				MP Description	ion: TO C	
Equipment (econ. Me	thod: 36	suchet r	MPC W	1701	10 <i>X</i>	Depth to Wa	ater Belor	e Pump Installatio	on (ft BMP):	76.73	Time: 0		GW Disposal		Pond
			emp.		Н		nductivity	Disso	lved Oxygen	Redox	Potential	Tuel	oidity	Diviso		
	PL G	. ((°C)	(pH l	Jnits)	MKus	/cm)		P (mg/L)		(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	REA	CHANGE'	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1031	X	32.29		7.57		4.48		1.75/		159		429	Company of the Company	100	26.84	Ø
1036	X	29.84		7.61		4.68		0.73		16)		425			26.85	500
1041	X	29.27		-				1			 			100		
	046 X 29.01 7.64 4.74 0.19/0.63 160 175 100 26.85 (500 05) X 28.97 7.64 4.73 0.17/0.41 159 114 100 26.85 2000															
	1046 X 29.01 7.64 4.74 0.19/0.63 160 175 100 26.85 1500 1051 X 28.97 7.64 4.73 0.17/0.41 159 114 100 26.85 2000															
	1051 X 78.97 7.64 4.73 0.17/0.41 159 114 100 26.85 2000 056 X 28.82 7.64 4.71 0.16/0.40 158 75.3 100 26.86 2500															
	051 X 7897 7.64 4.73 0.17/0.41 159 114 100 26.85 2000 056 X 28.82 7.64 4.71 0.16/0.40 158 75.3 100 26.86 2500															
	110 X 29.02 7.64 4.68 0.14/057 157 47.9 100 26.86 20-0															
1106	1	29.02		7.63		4.67		0.12	036	157		26.8		100	24.84	ممور
_1111	X	29.07		7.62		4.64		0.11	0.1	157		16.2		100	76.86	4000
1116	\mathcal{L}	29.00		7.62		4.63		0.01		155		10.3		100	26.86	4500
121	X	29.20		7.63		4.60	,	0.0		153		7.5		100	26.86	J-800
1126	X	29.31		7.63		461		0.06/								5500
1130	X					110		0.4/		153		4.6		100	76.86	3,7 00
1130		37 AB	ILIZAN	0~												
-													3	£ 6.20.	17	
Comple ID:	1000	1 -21			- 11 . 15											
Sample ID:	mple Co	N-04:	I-20170	620	Duplicate ID	UFM	W-041		30620-FD						COC Time:	1130
36	mbie co	namer						Materia	I Codes: VOA = 4						ene; O=Other	(Specify)
Number	Code	Volum	ne Pre	servative	Intended A	malysis and/o	or Mothod		econtamination:	YN	Field Filtered:	YN	COC Numbe	r.		
	0000	T Oldin	110	JOITAINO	_ interioco /	uldiyələ alitut	or Mealou	Commi			4					
		2 - 0							(olor:	cloud	7, cled					
NER	1 1	7690	ea T.J.	Samp	2011	11			_		-1 (
		1			0			Í		1	\bigcirc					
								Signal	ure(s):	1	417					1
			IAVE STABL					E WITHI	N:		1					
									Redox Pote	ntial; ±	: 10% for E	Dissolved	Oxvaen	and Turbi	ditv	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

Page ___ of _____

NERT, Henderson, NV Project

				132			,,,,	on and		MILI	OAIVII E	ING LC	Ju		N	EHI, Henders	son, NV Project
Task Name:	AF	Arc	A TR	Atability	Study	Task Manag	er: G.R	emer			Task No:	M/3			Well ID:	IFMW-0	4D
Field Sampl	ers:	D.	Kent	4							Recorded b	y: D. Kea	idy	-	Date: 6	21.17	
Well Depth (ft BGS):	50	MP Dis	stance AGS (ft):	-	Well Depth (ft BMP):		Screened/O	pen Interval 7	op.	45	(ft BGS)		(ft BMP)
Well Diamet	er (in):		2	PID/FI	D Readings E	3eneath Inner	Cap (ppm c	je akb): 👤			Screened/O	pen Interval E	Bottom:	0	(ft BGS)	-	(ft BMP)
				Sample Prol		: Pdy t	bone	Pump Intake	Depth:	17/	(ft BGS)	_		(ft BMP)	MP Descripti	on: TOC	
Equipment (econ.	Meth	od: 3	bulket n	nse u/L	igunot	0	Depth to Wa			n (ft BMP):	\$ 24.3	Time: 0	316 (4-4-8	GW Disposal	: GW-1/F	bnd
	<u>ا</u> ق	9	Т	emp.	P	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential		oidity	Purge	Depth to	Cum. Vol.
	PURGING	₫		(.C)	(pH l	Units)	(uS	/cm)	DO (mg/L)	ORP	(mV)	100000000000000000000000000000000000000	TU)	Rate	Water	Purged
Time	2 3	SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0450	X	3	1.13		7.51		5.33		3.32/2.12		117		> 1000		100	26.74	
0455	X	2	8.93		7.67		5.35		2.67/1.91		115		465		100	76.83	500
0500	X		7.87		7.70		5.29		236/1.61	1	116		240		100	76.85	000
0505	X		7.49		7.71		5.27		1.99 1.23		116		124		100	26.86	1500
0510 X 27.27 7.71 6.24 1.79/1.31 116 83.7 100 76.86 200																	
0515 × 27.15 7.71 5.22 154/1.77 115 38.9 100 26.86																	
	0520 1 27.16 7.70 5.21 1.45/1.14 115 29.4 100 26.86 2000																
0525 V 710/ 7.20 5.70 120/11 11/																	
0520	X		4.89		7.19		5.19		1.31 1.10		114	<u> </u>	11.1		100	76.86	3200
0530 0535	X		6.94		7.70	,	5.18		1.31/1.0		113		7.41	/	100	26.86	
0540	5		6.94	J	7.70		5-17	<i>f</i>	1.29/1.0	,	(13	1			100	26.86	3000
0545	~			13pmon	7.70		2-11		istlind		113		4.98		1 33	C10.010	2 94-
S		7	1130	יוטן ני דַבַּ ויי		-											
													EX	521			
-														-6.51.	7		1
Sample ID:	(112)	001-1	.041	20170	(3.1	Duplicate ID:					QA/QC Sam	-l4D.				000 7	0545
	mple			>-20170	061	Duplicate io.			Material Co	vies: VOA – A			r Glace: CG	-Cloar Glace:		COC Time: lene; O=Other (0545
	marc	and a			4					ntamination:		Field Filtered		COC Numbe		erie, O=Oiller	Specify
Number	Co		Volu	me Pre	servative	Intended A	nalysis and/	or Method	Comments		* 1076.2.—				**		
									Ι,	1	(b. /						."
	2-		N la						1	610m; (lody (d	ear					
NE	K1	H	P H	rea T.S	s. Jan	neling	Jet				16	1					
						-0_			Cignotuse	1	EN S						1
INDICATO	R PAF	AMF	TERS	HAVE STABL	IZED WHEN	V3 CONSEC	LITIVE RE	ADINGS AR	Signature	s).							
				Specific C						edox Pote	ential:	: 10% for	Dissolve	d Oxymen	and Turbi	dity	
					0 0 "		20.0							- 2414011		Mark V	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units



TETRA TECH



LOW FLOW GROUNDWATER SAMPLING LOG

NERT, Henderson, NV Project

		_														
Task Name	AP	Area Ti	centalala	Study	Task Manag	er. G (coener			Task No:	MI3			Well ID: U	FMW-	25.5
Field Sampl	ers: 🍃	.Kead	4	1						Recorded by	r. D.K	eady		Date: 6	.21.17	
Well Depth	It BGS):	₹0	MP Di	stance AGS ((t):		Well Depth ((II BMP):	~	Screened/O	pen Interval T		25	(It BGS)		(It BMP)
Well Diame	er (in):	Ž	PID/FI	D Readings E	Beneath Inner	Cap (ppm cg	je akb): —	_		1	pen Interval B		0	(ft BGS)		(It BMP)
Pump and 1	ubing Ty	pe: QFD	Sample	200 /L)~	er): poly	telahan	Pump Intake	Depth: —	3.5	(fi BGS)	-		(It BMP)	MP Description	on: TOC	
Equipment (Decon. M	elhod: 7	hiket	myes ,	1 - aru	hat			Pump Installatio		76.94	Time:		W Disposal		And
								,						1		
	2 3		emp. (°C)		H Jnits)	spec Co	nductivity	1	ed Oxygen		Potential (mV)		oidity TU)	Purge	Depth to	Cum. Vol.
T'	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Harba/A	(Ing/L)	READ	CHANGE*	READ	CHANGE.	Rate (ml/min)	Water (It BMP)	Purged (mi)
Time			OTAMOL		UIIANGE		GRANGE	<u> </u>			CHANGE		CHANGE	(moneth)	(it divit)	
0634	X	27.33		7,19		7.41		2.00/1.		16		294		100	26.99	9
0639	X	26.97		7.23		7.22		0.52 1.	the second second second second	162		141		[06	27.09	500
0644	X			7.23		7.09		031/1.0	9	162		567		100	27.14	.[0.00
0649	X	26.91		7.22		7.05		0.35/1	À	162		78.9		100	Z7.20	(J-0)A
0654	X	24.94		7.72		7.03		0.32 1.9	75	[6]		16.2		loo	27.24	2004
0659 x 26.95 , 7.22 , 6.99 0.24/1.01 160 , 7.3													,	100	27.27	שרו
NTIN	+ +				1		1					A second to the second	1			
0704 X 27.03 7.23 6.93 0.28/1.01 159 3.6 100 27.3. 3.000														7.00		
שודט	7	24536	LIZATI	04	-					-						
1	+ +		-						1							
	11.															
1																
														/		
1				/					1					7		
•	17											1	15.5%	1	- 1	
	1							-	+			0	- 6			
Sample ID:	I/E/M	AL AL	5-20(70)	2.1	Duplicate ID				1	QA/QC Sam	mlan#Da				000 T	
S	ample C	nntainer	3-20110	04	Copilcate ID			Material			•	· Class. CC	Class Class			07/p
	- mareni	a							Codes: VOA = 4 contamination:		Field Filtered		COC Numbe		ene; O=Olner (Specify
Number	Code		me Pre	servalive	Intended A	\nalysis and/	or Method	Commen		<u> </u>	Lieur Linteren	. 1 14	COC Numbe			
		Ī	-		-					01						
Almer	- ~			1		-			(0/01	: Clei	10					
Mer	H	1-prea	T.S. 8	yel James	1- 60	1					0					
The state of the s	1			- 4			- 1			1	4 11					
				1				Signatu			1	1		100		
			HAVE STABL													
± 0.1 for	pH;	± 3% for	Specific C	onductiv	ty and Te	mperatu	re; ± 10	mv for	Redox Pote	ntial; ±	10% for I	Dissolved	1 Oxygen	and Turbi	dity	
		around Surfa		C - Centiorad					Midram/Liter			MP - Messur			OA Ounting to	

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surfa ID - Identification

mg/L - milligran mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units





	2.0.4		. 1 219					-		Isk Name: AP Area Treate Libry Stuly Task Manager: Gr. Roemer Task No: MIS Well ID: UFMW-05I													
Task Name	PLA	rea Trea	tability.	Stuly_	Task Manag	er: (y.	loemer				Task No:	MIZ			Well ID: (/	FMW-1	DET						
Field Samp		> Keal	4	/							Recorded b	y: D Ke	h.			21.17							
Well Depth	(ft BGS):	40	MP Di	stance AGS	(ft):		Well Depth (It BMP):				pen Interval	Fop:/ 30		(ft BGS)	<u> </u>	(ft BMP)						
Well Diame		2			Beneath Inner	Cap (ppm c	ge akb):		_		1				(ft BGS)		(ft BMP)						
Pump and 1	ubing Ty	pe: OE	Sample	Pro (1	date.	polytheig	Pump Intake	Depth:	-	17.5	(It BGS)			(ft BMP)	MP Description	on: TOC							
Equipment I	Decon. M	ethod:	? broket	Uppe m	Light has		Depth to Wa	ter Befo	re Pur	mp Installatio		7683	Time:		GW Disposal	100							
	0	area and a second	emp.	-	Н		nductivity	-								GWI	POR						
	N N		(*C)		Units)		/cm)			d Oxygen ng/L)	The second second second second	Potential (mV)		bidity TU)	Purge	Depth to	Cum. Vol.						
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	RE/		CHANGE*	READ	CHANGE*	200	1	Rate (ml/min)	(ft BMP)	Purged						
0739		1			OTTATAL		DIMINUE			CHANGE		CHANGE	READ	CHANGE*	(TIMETHIE)		(ml)						
	X	27.98		7.66		5.48		1.53			153	-	662		100	Z7-98	9						
0744	K.	27.93		7.68		5.0		0.42	1.70		152		409		100	27.00	500						
0749	K	27.94		7:68		5.10		0.28	1.0		151		273		100	27.00	(eco						
0754	X	27,94		7.67		5.07		0.12	1-21		150		133		IOP	27.00	2 1500						
0759	X	27.97		7.68		5.08			1.11		150		103		100	27.00	7.000						
0804	804 X 27.99 7.68 5.08 0.13 (10) 149 55.5 100 27.00 2500 809 X 28.03 7.68 5.08 0.11 0.97 148 28.8 (00 27 00 2000																						
0809	1809 X 28.03 7.68 5.08 0.11 0.97 148 28.8 (00 27.00 2000																						
	1809 X 28.03 7.68 5.08 0.11 0.97 148 28.8 (00 27.00 2000																						
	X	28.15													000	27.00	3500						
0819		:	/	7.66		5.06		0.09			147		142		100	77.00	4000						
0824	X	78.23	1/	7.64		5.04		0.08			146		9.29		100	27.00	N 200						
0829	у.	28:34		765		503°		0.07	20)		146		4.49		100	77.00	J7000						
0835	X	STABI	LIZATION)									, (-)										
														AK	المالم								
Sample ID:	VFM	U-053	120170	62.1	Duplicate ID:			_			QA/QC Sam	nles/ID:				COC Time: ©	2						
	ample Co			POL	E Last	E		Materi	al Cor			•	r Glace: CG	-Cloar Glace:	DE-polyathyli	ene; O=Other (Speciful .						
	Code							Field [Decon	tamination:	Y N	Field Filtered		COC Numbe		ille, O=Offici (a	Specily)						
Number	Code	Volun	ne Pre:	servative	intended A	nalysis and/o	or Method	Comm	_					COO Hallibo	-								
								1		1	1												
				7	-	- 1	1.0	1	L	0/01:0	lear	1					***						
	UER	T PI	TTE	1.7	Jamp	by H	7			1	^	1					- 1						
•					0-11-1	1				1	(1)	1/1-											
						V		Signa	iture(s	3):	H	1											
INDICATO	H PARA	METERS F	AVE STABL	IZED WHEN	3 CONSEC	UTIVE REA	ADINGS ARE	E WITH	IN:		<i>y</i>	(/											
± U.1 TOF	Poless C	± 3% TOF	Specific C	onductivi	ty and Te	mperatur	e; ±10						<u>Dissolve</u>	Oxygen	and Turbic	dity							
600	· DRIOM C	Fround Surfa	ice !	C - Centigrad	е	GS - Grour	nd Surface	ma/L -	million	ram/Liter	min - Minu	te l	MP - Measur	ing Point	- (A - Ougliby Ac	CHESTON						

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

NTU - Nephelometric Units



Page 1 of 1

NERT, Henderson, NV Project Task Name: AP Area Treatability Task Manager: (T. Roemer Task No: MI3 Well ID: UFMW - 05D Field Samplers: D. Keady Recorded by: D. Ceaky 6.21.17 Date: Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) (ft BMP) Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BMP) (ft BGS) Pump and Tubing Type: QED Sample Pro Solater); poly tobing Pump Intake Depth: 47-5 (ft BGS) (ft BMP) MP Description: Toc Equipment Decon. Method: 3 bucket cinc w/ Langar C Time: 97 17 / 641-77 GW Disposal: Depth to Water Before Pump Installation (ft BMP): GWH Rond 75.72 PURGING Temp. pH Spec Conductivity **Dissolved Oxygen Redox Potential Turbidity** Depth to Cum. Vol. Purge (°C) M (úS/cm) (pH Units) LPO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ (ml/min) (ft BMP) READ CHANGE* READ CHANGE* CHANGE* READ READ (ml) CHANGE* CHANGE* Time 33.85 1.44 1.61 6.27 142 26.84 7.44 216 90 6 31.01 26.87 100 6.58 0.4\$1.41 124 198 00 79.96 0920 0.17/1.22 124 -112 00 26.87 0925 10.09 h.09 100 76.87 500 0930 26.87 0.01/1.01 00 2000 110 0935 29.66 26.2 002/0.9 6.67 26.87 III 100 7500 0.01/0.88 19.2 29.64 76.87 6.65 Ш 300 100 29.61 6.64 0.00/0.86 76.87 112 13.0 LAO 3000 0.00/0.84 0950 29.75 (0.63 7.23 26.87 00 466-().00 18.92 7.57 700 30.00 117 26.87 4.75 100 STABILIZATION 005 Sample ID: VFMW - 05D - 2017-0621 MS/MSD **Duplicate ID:** QA/QC Samples/ID: COC Time: 00 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Code Number Code Volume Preservative Intended Analysis and/or Method Comments: color= cloudy / clear NERT AP Area T.S. Sampling Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page of 1

LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project Task Manager: G. Roemer Task Name: AP Area Treatability Study Task No: 113 Well ID: UFMW-065 Field Samplers: Date: 6.21.17 Recorded by: N. Keady Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) (ft BMP) PID/FtD Readings Beneath Inner Cap (ppm cge akb): Well Diameter (in): 2 Screened/Open Interval Bottom: (ft BGS) (ft BMP) Pump and Tubing Type: QED Sample Pro (bladder) ; poly thong Pump Intake Depth: (ft BGS) (ft BMP) MP Description: TOC 3 bucket ringe w/ Liquinger Depth to Water Before Pump Installation (ft BMP): 2501 Equipment Decon. Method: Time: 0720 \$19-1-16W Disposal: 6W-11 Pond SAMPLING PURGING Temp. pH Spec Conductivity **Redox Potential Dissolved Oxygen Turbidity** Purge Depth to Cum. Vol. DO (mg/L)
READ CHANGE (pH Units) (°C) m (uS/cm) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* READ CHANGE* (ml/min) Time READ READ (ft BMP) (ml) CHANGE' CHANGE* 37:59 110 7.22 5.51 135 624 76.75 100 0.51/1.72 1106 32.67 7.23 5.77 142 535 26.78 90 100 31.83 7.25 0.32/1.60 249 76.80 00 400 31.39 7.27 0.19/1.52 90.6 1500 2680 00 7.30 12 5.77 0 .08 1.47 26.80 7 400 00 1126 31.0 0.02/1.36 142 76.80 00 7500 31.09 142 131 0,00/1.33 7.30 17.7 26.80 100 3000 31.22 1136 000/130 7.31 5.77 141 12.9 26.80 00 3500 30.94 7.30 5.78 0.00/1.28 142 7.16 76.80 100 4000 1146 30.08 7.30 141 5.77 0.00/1.25 3.23 100 26-80 4700 1150 STABILIZATEON DK 6-21-17 Sample ID: UFMW -065 - 2017-062 **Duplicate ID:** QA/QC Samples/ID: Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number: Code Number Volume Code Preservative Intended Analysis and/or Method Comments: color: cloudy /clar DERT Area T.S. Sampling 'INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential;

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

± 10% for Dissolved Oxygen and Turbidity



Page __ of _

TOT Handanan NV Durket

007		110					CUITOT	MILN	SAIVIP	LIIVG L	JG		N	ERT, Hender	son, NV Project
HY	rea Tr	cettabiliz	by Guly	Task Manag	er: G. K	Coemer			Task No:	M13			Well ID: /	IFMW -	-06I
_			<u> </u>						Recorded b	y: D. Keo	dy				
							ft BMP):					35	(ft BGS)		- (ft_BMP)
		PID/FI	D Readings E						Screened/C	pen Interval E	Bottom:	90	(ft BGS)		(ft BMP)
			bladle)	; p.14 tuli	m	Pump Intake	Depth:	37.5	(ft BGS)			(ft BMP)	MP Description	on: TOC	
Decon. Me	thod: 3 b	ucket r	mse w/	Liquino	<u> </u>	Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	20.60	Time: 🔾	821 (6.19.)	GW Disposal	: GW-//	Bod
0 9	Te	emp.	р	Н	Spec Co	nductivity	Dissolve	d Oxvaen	Redox	Potential					
를 를			(pH l	Jnits)	M (ús	/cm)	11 DO (mg/L)	The state of the s					Charter agreement to	Cum. Vol. Purged
SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
X	31.46		7.43		5.46		1.46/1.51		12.7		113		100	7(.3)	
X	29.65												-		000
X															1000
1.		-													
+															1200
0656 X 78.30 7.54 5.48 0.06/0.9 129 30.3 100 26.73 2500															
070) X 28.75 7.54 5.48 0.04/0.11 129 30.3 100 26.73 2500 070) X 28.75 7.54 5.48 0.03/0.11 128 23.0 100 26.73 3000															
070) X 28.75 7.54 5.48 0.030.11 128 23.0 100 26.73 3000															
													100	26.73	J500
			1.56				-		/				100	76.73	4000
1 1 1			7.76		5.51						8.40		100	76.73	4000
1			+57		7.01		D.0010.80		130		4.73		200	26.73	5-00
N	את רצ	(UI ZATI	M												
										7					
											C 6.Z	217			
UPMU	1-06I	-20170	622	Duplicate ID:	_										0730
malcha	ntainer					Town In Street	Material Co	des: VOA = 4	0 ml glass via	al; AG =Ambe				ne; O=Other (Specify)
Code	Volum	ne Pres	servative	Intended A	nalweie and/	or Mathod			Y N	Field Fillered:	YN	COC Number			
-				WILDINGEG A	naiyasa anak	/ Metriou	Comments:		_						1
								Color :	(lear	. 1/1					
SAP	Area	T.S. Sa	molina	- 80-				~		1					
			V A						40						1
DAS::							Signature(s	s):	1						
H PARAM	METERS H	AVE STABLI	ZED WHEN	3 CONSEC	UTIVE REA	DINGS ARE	WITHIN:						16 25-		7
Relow Gr	ound Suda	Specific Co	C - Contigmed	ty and Te	mperatur	e: ±10	mv for Re	dox Pote	ntial; ±	10% for [<u> Dissolved</u>	Oxygen a	and Turbic	lity	
	ers: D. (It BGS): (It BGS)	ers: D. Keady (it BGS): 4d ler (in): 2 Tubing Type: (ED S Decon. Method: 31 READ X 29.65 X 29.65 X 29.73 X 28.73 X 28.73 X 28.73 X 28.21 X 28.21 X 28.21 X 28.69 X 5778 A FARAMETERS H PH: ±3% for:	Resist D. Keady (It BGS): 40 MP Di (It BGS):	res: D. Keady (It BGS): 4d MP Distance AGS (rer (in): 2 PID/FID Readings E rubing Type: (ist) Sample fro (hladdy) Decon. Method: 3 b v cket rmsc w/ Temp. (°C) (pH to READ CHANGE* READ X 29.65 7.46 X 29.10 7.51 X 29.10 7.51 X 29.30 7.54 X 28.37 7.54 X 28.37 7.54 X 28.37 7.54 X 28.30 7.56 X 28.21 7.56 X 28.21 7.56 X 28.21 7.56 X 28.20 7.56 X 28.2	ers: D. Keady (It BGS): 4d MP Distance AGS (It): PID/FID Readings Beneath Inner (ubing Type: (IED Sample Fro (Islatu); pit No. Decon. Method: 3 bucket rings w/ L. 7. No. PED READ CHANGE: READ CHANGE: X 29.65 7. 46 X 29.65 7. 46 X 29.65 7. 46 X 29.70 7.51 X 28.77 7.53 X 28.77 7.54 X 28.77 7.56 X 28.77 7.56 X 28.70 7.50 X 28.70 7.50 X 2	Task Manager: G. Mers: D. Keady (It BGS): 40 MP Distance AGS (It): (It In In It In In It In In It In It In In It In In It In In In In In In In In In	Temp. (*C) (*C) (*C) (*C) (*C) (*C) (*C) (*C)	Temp. Physical Change: (**Ready (II): Well Depth (It BMP): PiDFID Readings Beneath Inner Cap (ppm cge akb): Pump Intake Depth: Decon. Method: 3 bucket rings w/ Lighton Depth to Water Before Pump Intake Depth: (**C) Physical Read Change: Re	Task Manager: G. Roemer (It BGS): 40 MP Distance AGS (II): Well Depth (It BMP): retrin): 2 PIDFID Readings Beneath Inner Cap (ppm cge akb): Pump Intake Depth: 37. 5 Depth to Water Before Pump Installation Depth to Water Before Pump Installation Pump Intake Depth: 37. 5 Depth to Water Before Pump Installation Pump Intake Depth: 37. 5 Depth to Water Before Pump Installation Depth to Water Before Pump Installation READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ CHANGE: READ	Task No: Pers: D. Leady Pers: D. Lea	Task Mo: MP Distance AGS (fil: Well Depth (it BMP): Screened/Open Interval Engine Type: Get Sample For (it ladds) Filt Task Mo: MP Distance AGS (fil: Well Depth (it BMP): Screened/Open Interval Ending Specific Power For (it ladds) Filt Task Mo: MP Distance AGS (fil: Well Depth (it BMP): Screened/Open Interval Ending Specific Power For (it ladds) Filt Task Mo: Mell Depth (it BMP): Screened/Open Interval Ending Specific Power For (it ladds) Filt Task Mo: Mell Depth (it BMP): Screened/Open Interval Ending Specific Power For (it ladds) Filt Task Mo: Mell Depth (it BMP): Specific Power Specific Power For (it ladds) Filt For (it ladds)	AP	Recorded by D. Recorded by	Method Text Text Text Method Task Manager C. Rocerver Task No. P7/3 Date Cert	## Property Communication Property Communica

BGS - Below Ground Surface BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surfaction

mg/L · milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

OW	FLOW	GROUNDW	ATER	CAMDI	INIC	OG
.UVV	FLUVV	UNUUNUN/	AICH	SAIVIPL	JIYG L	.UG

NERT Handerson MV Project

		<u> </u>			- 19999					<u> </u>				14	En I, nenuels	son, ivv Project
Task Name:		Area T	reatability	Study	Task Manag	er: G.R	semer			Task No:	MIZ			Well ID:	JAMW -	965
Field Sample		Keady	7	1						Recorded b	y: D.K.	مالم			.22.17	
Well Depth (50	MP Dis	stance AGS (ft):	-	Well Depth (ft BMP):		+	pen Interval 1		45	(ft BGS)		(ft BMP)
Well Diamet	er (in):	2	PID/FI	D Readings (Beneath Inner	Сар (ррт с					pen Interval E		70	(ft BGS)		(ft BMP)
Pump and T	ubing Ty	pe: QEI	Sample 1					Depth: 43	سو ما	(ft BGS)		_	(ft BMP)	MP Descripti	ion: 10C	(K Ditt)
Equipment C	econ. M	ethod: 3 b	usket ni	ne wil L	ZON'US	0		ter Before Pu		-	76-61	Time: 0		GW Disposa		Pond
	(5)		emp.	-	Н	C O	THE REAL PROPERTY.	and the last of						Татт второва	. 0.00	1 ((
	PURGING SAMPLING	10	:np. 'C)		Jnits)	Spec Co	nductivity	Dissolve	Oxygen	100000000000000000000000000000000000000	Potential (mV)	The second secon	oidity	Purge	Depth to	Cum. Vol.
701	AMP GM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ I	CHANCE		granden of the state of	Lancas and the same of the sam	TU)	Rate (ml/min)	Water	Purged
Time	<u></u>		OTARGE		CHANGE	The second second	CHANGE		CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0803	X	30.15		7.65		6.51		141/15		150		>1000		00	26.19	\mathscr{Q}
0808	X	28.62		7.69		6.77		0.59/1.40		149		71000		100	27.05	500
0813	X	28.16		7.72		6.75		0-29/1-31		147		832		100	77.06	1000
0818	X	28.04		7.72		6.65		0.17/1.25		145		754		100	27.04	500
0823	0823 × 27.91 7.73 6.58 0.07/1.14 143 535 100 27.06 2000 0828 × 27.82 7.73 6.54 0.03/1.09 141 376 100 27.06 2800															
0828	0828 4 27.82 7.73 6.54 0.03/1.07 141 376 100 27.06 2500															
	0828 \(\begin{array}{c c c c c c c c c c c c c c c c c c c															
0838	833 X 27.76 7.73 6.51 0.01/1.00 140 322 100 27.06 7000															
0843	1			7775				0.00,0.96				266		(%)		1200
	8	27.75		7.74		6.49				137		188		100	27.04	4000
0848	$\tilde{\mathcal{K}}$	Z7.49		7.74		6.48		0.00 0.14		136		169		00	27.06	450
0853	X	Z736		7.74		6.48		8.00/0.92		135		153		180	77:06	2000
- 0.0	X	27.27		7.74		6.47		0.00/0.70		134		141		100	27.0€	20go :
0903	X	27.31		7.74		6.47		0,00/019		134		129		100	27.%	(acoo
0910	X	STABL	LIZATION													
_											1	1507	./7-			
Sample ID:	VFML	4-06D-	2-1706	22	Duplicate ID	1				QA/QC Sam		And the second		15	COC Time:	0160
Sa	mple Co	ontainer		1				Material Co				r Glass; CG :	-Clear Glass:		lene; O=Other (Specify)
	Code								tamination:		Field Filtered		COC Numbe			
Number	Code	Volun	ne Pre:	servative	Intended A	nalysis and/	or Method	Comments:								
										cloud	(Juan					1
NER	T 1	N // -	4-6-	_				(olor!	Le oug	(char	/				
JUCK		P Are	a 4.5.	Jamp	is of	e+		ļ	_	\						
	-				0			C:	-A.	Y						
INDICATOR	PARA	METERS H	IAVE STABLI	ZED WHEN	13 CONSEC	LITIVE DE	DINGS AD	Signature(:	5]							
			Specific C						dox Pote	ntial: +	10% for I)iecolyss	Ovues	and Turk	- Carr	
		cound Surfac		C - Centiored				mall millio				Jissoived		and Turbi	uity	

BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

	Soil Flush	ning IRM -	Daily/B	i-Weekly GW Gauging Form
Project Name:	NERT T	ask K01 - Soil Flus	hing IRM	Date: 8/14/17
Address:	510 S. 4th Street,	Henderson, NV 89	015	Gate Access Code: 6932
Technician:		SUZA		
Weather:	940=			
Monitoring We				
Well ID	Depth to Water (ft btoc)	Total Depth of Well (ft btoc)		Notes (well condition, etc.)
			PLOT 1	(NORTH)
Injection Wells				
UFIW-01\$	27.02		155	
UFIW-011 UFIW-01D	27.19		1157	
UFIW-02S	27.60 26.88		159	
UFIW-023	26.92		1201	
UFIW-02D	27.09		1202	
UFIW-03S	26.95		1204	
UFIW-03I	27.04		205	
UFIW-03D	27.34		1206	
UFIW-04S	27.34		1200	
UFIW-04I	27.30 27.45	<u></u>	1209	
UFIW-04D	27,45		1210	
Monitoring We				
UFMW-01S	28.24		1144	
UFMW-011	27.86		1145	
UFMW-01D	27.99 DRY		1146	
UFMW-02S UFMW-021	28,96		1148	
UFMW-02D	28.73		1149	
UFMW-03S	DRY		152	
UFMW-03I	27,54		1153	
UFMW-03D	27.67		1154	
Extraction Wel	ls	· · · · · · · · · · · · · · · · · · ·		
E1-1	27.21		1100	
E1-2	38.69		102	
E1-3	1 41.39		1104	
)_14()A(_N_			PLOT 2	(SOUTH)
Injection Wells UFIW-05S		\		
UFIW-055	\			
UFIW-05D		\		
UFIW-06S	\	\		
UFIW-06I				
UFIW-06D			$\overline{}$	
UFIW-07S	\			5
UFIW-07I				
UFIW-07D	- /		7	
UFIW-08S				
UFIW-08I	\			
UFIW-08D	<u> </u>	\		\
Monitoring Wei			10 IPI	
UFMW-04S	26.57		1217	
UFMW-04I UFMW-04D	26.55 26.49	-	1218	
UFMW-05S	26.94		1220	
UFMW-051	26.77		1223	<u> </u>
UFMW-05D	26.59		1224	
UFMW-06S	26,72		1226	
UFMW-06I	26,59 26,12 26,63	·	1227	
UFMW-06D	Z(n.65)		1228	** /
xtraction Weil	S		-	
E2-1	27.6	<u>_</u>	103	
E2-2	25.71		033	
E2-3	28.75 26.34 38.67		033 029 035 027	
E2-4	29.34		1035	<u></u>
E2-5	10,8c	1.	1027	



TETRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page	0	f

NERT, Henderson, NV Project

Task Name:	ask Name: AP Area Treatability Study Task Manager: G. Roemer Task No: M13 Well ID: UFMW-01\$																
Field Sample	ers: Je	I Riches	חכ	-					-		Recorded b	y: Jeff Riches	son		Date: \$/		
Well Depth (ft BGS	:		MP Dis	stance AGS (ft):		Well Depth (ft BMP): 29.5	i6	Screened/O	pen Interval T	Гор:		(ft BGS)	24	4 (ft BMP)
Well Diamet	er (in):	2		PID/FI	D Readings I	Beneath Inner	Сар (ррт с	ge akb):				pen Interval E			(ft BGS)	29	
Pump and T	ubing T	ype: QE	D Sa	mple Pro with	Poly Tubing			Pump Intake	p Intake Depth: (ft BGS) 26.5 (ft BMP) MP Description: TO						n: TOC		
Equipment D	econ.	vlethod:	3 Bud	ket Rinse with	h Liquinox			Depth to Wa				GW Disposal:	GW-11 Pond				
	<u>ق</u> ا		Te	mp.	р	н	Spec Co	nductivity	Dissolved	Oxygen	Redox	Potential		idity	Purge	Depth to	Cum. Vol.
			(*	'C)	(pH l	Jnits)	(uS	/cm)		ng/L)	ORP	(mV)		TU)	Rate	Water	Purged
Time	PURGING	REA	D	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0425	X	29,	10		6.97		4,38		1.21		142		52,0		Hand B	1282	
													0.,0			29,55	-~0,5
		Ha	00	1 6	3911	Dr	7	a11	ow	1	che						
		P		0	40	Cal	1/00	Line	> 5	900	0/0		7				J.
		1					1 2 6 7										
0599	5	(1	llect	Sampl	0 115	Pari 1-1)/< _ \)	17081	-7							
		1	الاحا	666-64	all 141	C. Ur	7010 - 0	1) - 04	11001								
		1			,												
			-	-													
		-												· · · · ·		-	
		ļ	_														
		-	_														
Sample ID:	1FM	W-0	5-	20170	817	Duplicate ID	:	1/4			QA/QC Sam	•	MA				0509
Sa	mpie u Matei	ontaine	Г													lene; O=Other	(Specify)
Number	Cod		olum	e Pres	servative	Intended A	nalysis and/o	or Method	Field Decon		N	Field Filtered	: Y) N	COC Numbe	r.		
							indiyoto dila	JI MOUIDA	Comments.			A=	1,99	72, I			
$\beta = 6.746$																	
		-	PA	rea Study S	Sampling B	ottle Set			Groundwate	er Color is	lear	,,,		-			
										7	1	0	2				
									Signature(s):	0/	/	<u> </u>				
				IAVE STABL						_	6						
± U.7 for	DH:	± 3%	tor	Specific C													
BGS -	0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity BGS - Below Ground Surface C - Centigrade GS - Ground Surface mg/L - millipram/Liter min - Minute MP - Measuring Point GA - Quality Assurance																

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units



Page ___ of ___

NERT, Henderson, NV Project

T 1 11						NEMI, D	anderson, i	INV Project
Task Name: AP Area Treatability St	udy Task Manage	G. Roemer	Task No: M13			Well ID: UFMW-011		
Field Samplers: Jeff Richeson			Recorded by: Jeff Riche	 son		Date: \$/16	117	
Well Depth (ft BGS):	MP Distance AGS (ft):	Well Depth (ft BMP): 39.52	Screened/Open Interval			(ft BGS)	31	(ft BMP)
Well Diameter (in): 2	PID/FID Readings Beneath Inner (Cap (ppm cge akb):	Screened/Open Interval	<u> </u>		(ft BGS)	20	<u> </u>
Pump and Tubing Type: QED Samp	ele Pro with Poly Tubing	Pump Intake Depth:	(ft BGS)	36.5	(ft BMP)	MP Description: TO	39	(ft BMP)
Equipment Decon. Method: 3 Bucke	t Rinse with Liquinox	Depth to Water Before Pump Instal	lation (ft BMP): 27.9			GW Disposal: GW-1		
40.1		The second secon						

	PURGING	I	emp. (°C)		oH Units)		nductivity /cm)	CALLSON STREET	d Oxygen ng/L)	Redox Potential ORP (mV)		Turbidity (NTU)		Purge Rate	Depth to Water	Cum. Vol. Purged
Time	S E	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1045	X	23.5	7	7.33		3.46		1.82		93		1915		200	27.99	0
1050	X	23.5[7.30		3.46		0.39		87		6.1		200	28.13	14
1055	X	23.53		7.15		3,48		0,00		82		4.1		200	28.15	-21
1100	X	13.62		7.15		3.48		0.00		71		3.7		200	28.09	34
1105				7:15		3,49		0.09		65		3.6		200	28.08	44
1119	X	23.47		7.15		3.50		0.00		59		3,6		200	2810	
1115		33.33		7.26		3.50		0.00		45		2.9		200	28,08	64
	X	23,32		7,25		3.53		0.09		43		2.3		200	28,10	
1130	X	73'3		7.23		2.22		2,00		42		2,/		200	28,08	-87
1130	X		ramet	400	CL	3.55	- 1	0,00		41		1.9		760	28,10	94
11.70		- 4	lect	Samp	le y	FMW	-011	20176	816							
ample ID:		101.1	17-201		-											

Sample ID: UFMW-011-201708/L Duplicate ID: NA QA/QC Samples/ID: Level 4 DC **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: (Y) N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: AP Area Treatability Study Sampling Bottle Set Groundwater Color is Clear Signature(s)

*INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:

± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



NERT, Henderson, NV Project

Task Name: AP Area Treatabilit	y Study Task Manage	er: G. Roemer	Task No: M13		Well ID: UFMW-01D		
Field Samplers: Jeff Richeson			Recorded by: Jeff Riches	ion	Date: 8/16/	17	
Well Depth (ft BGS):	MP Distance AGS (ft):	Weil Depth (ft BMP): 49.25	Screened/Open Interval 7	op:	(ft BGS)	34	(ft BMP)
Well Diameter (in): 2	PID/FID Readings Beneath Inner	Cap (ppm cge akb):	Screened/Open Interval E	lottom:	(ft BGS)	49	(ft BMP)
Pump and Tubing Type: QED S	ample Pro with Poly Tubing	Pump Intake Depth:	(ft BGS)	42.5 (ft BMP)	MP Description: TOC		
Equipment Decon. Method: 3 Br	cket Rinse with Liquinox	Depth to Water Before Pump Insta	allation (ft BMP): 27.5	2 Time: 0619	GW Disposal: GW-11	Pond	

	PURGING SAMPLING	T	emp. (°C)		H Units)	Contract Section 198	nductivity /cm)		d Oxygen ng/L)		Potential (mV)	Turbidity (NTU)		Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0950	X	25.94		7.44		5,04		6,21		723		80.4		200	27.52	0
0955	X	25,49		7.39		5.09		4,73		119		5,2		200	27.70	14
1000	X	72.30		7.35		5.09		3.65		97		1.0		200	27.73	26
1005	X	72,34		7.29		5.11		2.11		84		0,3		200	27,72	
1010	X	72.9	3	7,31		5,13		1.30		79		0.1		200	27.72	46
1015	X	25,2		7,20		5.14		0.81		72		0.2		200	27.7	25%
1020	X.	22.7	\$	7.20		5.16		0.79		69		0,1		200	27.73	6/_
1025	X	25,23		7,19		5,18		0.74		65		0,1		200	27,72	74
1030	X	25,29		7.23		5,29		0.69		61		2.1		200	27.71	86
																-
amnie ID: 4	10 500 0.00	1-010	201708	. 7	Duplicate II): V/	Δ			QA/QC San	anlas#D:	NA			COC Time:	1034

Sample ID:	UFMW.	-010-2017	10816	Duplicate ID:	NA	QA/QC Samples/ID: N/A COC Time: 10 34
Sa	mple Con	lainer				Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify)
	Material	THE CHOOL	100			Field Decontamination: (Y) N Field Filtered: N COC Number:
Number	Code	Volume	Preservative	Intended Ana	lysis and/or Method	Comments: $A = 1, 294$
					-	B= 4,090
	AF	Area Treata	bility Study Sam	pling Bottle Se	et	Groundwater Color is Clear -
-						Signature(s): M R
*INDICATO	R PARAM	ETERS HAVE	STABLIZED WHE	N 3 CONSECU	JTIVE READINGS AF	BE WITHIN:

± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page ___ of ___

NERT, Henderson, NV Project

Task Name:	AP Area	Treatability	y Study		Task Manag	er: G. Roen	er			Task No: M13 Well ID: UFMW-02S							
Field Sample	ers: Jeff A	licheson								Recorded by	y: Jeff Riches	ion		Date: 🔗	117/17	•	
Well Depth (ft BGS):		MP Dis	tance AGS	(ft):		Well Depth (ft BMP): 29.	19	Screened/O	pen Interval T	·oρ:		(ft BGS)	2	4 (ft BMP)	
Well Diamet	er (in): 2		PID/FII) Readings	Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval B	lottom:		(ft BGS)	2	9 (ft BMP)	
Pump and T	ubing Type	e: QED Sa	ample Pro with	Poly Tubing			Pump Intake										
Equipment D	econ. Met	thod: 3 Bu	icket Rinse with	Liquinox			Depth to Wa	ter Belore Pu	ump Installatio	n (ft BMP):	29/	7 Time:	0622	GW Disposal	: GW-11 Pond		
	PURGING SAMPLING		emp. (°C)		oH Units)		nductivity /cm)		Dissolved Oxygen DO (mg/L)		Redox Potential ORP (mV)		bidity TU)	Purge	Depth to	Cum. Vol.	
	~ 물	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	The same of the sa		READ	CHANGE*	Rate (ml/min)	Water (ft BMP)	Purged (ml)	
Time	ाट । छ	HEAD	CHANGE	HEAU	CHANGE	NEAU	CHANGE	NEAD	CHANGE	READ	CHANGE*	READ	CHANGE	(1110/1111/1)	(it Divit)	(1111)	
	1-1-1					_			-				-				
		(Nel	/			/		1/1		50	000	10		alla		
						-						1/			2116	C/Ca	
						/						V					
													 				
	+++								-					-			
													ļ				
													0				
												1					
													de				
					ļi						ĺ		8/1				
																-	
												_				,	
Sample ID:		1	11/4-		Duplicate ID	: 1//	A	***		QA/QC Sam	ples/ID:	NA			COC Time:	NID	
Sa	mple Cor	ntainer			1	141		Material C	odes: VOA = 4	10 ml glass vi	ial; AG =Amb	er Glass; Co	=Clear Glas	s; PE=polyethy	ylene; O=Other	(Specify)	
	Material							Field Deco	ntamination:	Y N	Field Filtered	: Y N	COC Numbe	er.			
Number	Code	Volu	me Pre:	servative	Intended /	Analysis and	or Method	Comments	i:								
								1			WIP	//	DV	- 🗸			
		D Aros 7	Frantability C	tudu Com	ling Bottle	Cat		Groundwa	las Calasia			// .	U.	/			
	A	r Area I	reatability S	iuuy Saili	Jimy Bottle	361		Guounowa	iei Guidr IS	2-		0	DI			27	
		-						Signature	e(s):	1		/ _					
INDICATO	R PARAM	METERS	HAVE STABL	IZED WHE	N 3 CONSE	CUTIVE RI	EADINGS AF			-							
± 0.1 for	pH: ±	: 3% for	Specific (Conducti	vity and T	emperat	ure: ±10	mv for	Redox Po	tential:	± 10% fo	r Dissolv	ed Oxya	en and Tur	rbidity		
		THE PARTY OF THE P					The second second second second	A SALES AND A SALES AND A SALES AND ASSAULT									



Task Name: AP Area Treatability Study Task Manager: G. Roemer Task No: M13	NERT, Henderson, NV Proje Well ID: UFMW-02I
Field Samplers: Jeff Richeson Recorded by: Jeff Ric	cheson Date: 8/17/17
Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 39 Screened/Open Intervi	
Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Intervi	
Pump and Tubing Type: QED Sample Pro with Poly Tubing Pump Intake Depth: (ft BGS)	36.5 (ft BMP) MP Description: TOC
Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (ft BMP): 2-7,8	Time: 0624 GW Disposal: GW-11 Pond
g 열 Temp. pH Spec Conductivity Dissolved Oxygen Redox Potentia	11 11 11 11 11 11 11 11 11 11 11 11 11
들 글 ('C) (pH Units) (uS/cm) DO (mg/L) ORP (mV)	(NTU) Purge Depth to Cum. Vol. (NTU) Rate Water Purged
Time S READ CHANGE' READ CHANGE	1
1015 × 24.67 7.49 4.64 1.58 123	509 200 29.83 01
1020 X 24.53 7.46 4.88 0.54 120	
1025 24,50 7.44 4,79 0.28 115	
142 6 17 18 18 18 18 18 18 18 18 18 18 18 18 18	5.7 200 29.98 36
ANI - W	114 200 29.78 46
	0.9 200 29.99 57
1045 × 24.52 7.39 4.74 0.00 90	200 30,06 6
Sample ID: UFMW-071-201708/7 Duplicate ID: W/O QA/QC Samples/ID:	MA COC Time: /045
	nber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify)
Material Field Decontamination: Y N Field Filter	red: (Y) N COC Number:
Number Code Volume Preservative Intended Analysis and/or Method Comments:	
4	-1,112
AP Area Treatability Study Sampling Bottle Set Groundwater Color is	= 7,779
AP Area Treatability Study Sampling Bottle Set Groundwater Color is Clear B	/•
I was	R
INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:	
± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% f	for Dissolved Ovygon and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



	LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project															
Task Name	AP Are	a Treatabili	ty Study		Task Manag	jer: G. Roem	ier			Task No: M	113	201140040		Well ID: UF		,
Field Sampl										Recorded by	y: Jeff Riche:	son		Date: S	(17/1-	7
Well Depth	·			istance AGS (Well Depth ((ft BMP): 49		Screened/O	pen Interval 1	Гор:		(ft BGS)	4	4 (ft BMP)
Well Diamel				ID Readings I	Beneath Inne	r Cap (ppm c	ge akb):			Screened/O	pen Interval (Bottom:		(It BGS)	4	9 (it BMP)
Pump and T	ubing Ty	pe: QED S	ample Pro with	Poly Tubing			Pump Intake	ke Depth: (ft BGS) 46.5 (ft BMP				(ft BMP)	MP Descripti	ion: TOC	. ,	
Equipment (Decon. M	lethod: 3 B	ucket Rinse wit	h Liquinox			Depth to Wa	ater Before Pump Installation (It BMP): 29,89 Time: 0629			629	GW Disposal: GW-11 Pond				
	ပ ပို့	T	emp.	р	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox F	Potential		idity			
	PURGING		(°C)	(pH l	Jnits)		(uS/cm)		DO (mg/L)		(mV)		ru)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(mi)
0835	X	24.62		7.30		5.74		Liff		127		34.6		200	29.89	01
0840	X	25,43		7.34		5.72		0.25		98		25.7			1	2011
0845	Y	25.86		7,28		5,65		0.00		101			<u> </u>	200	29.98	
0850		25.85		7.25								V. /-		200	30.04	24
0855		25.79		7,20		5,65		0,00		100		0.5		200	30.02	36
	2	25.79	-	7,27				0.09		92		0.0		200	30.01	46
-900 0905				7,33	<u> </u>	5.62		0,00		83		0,0		200	29.99	57
	3	25.78				5.61		0,00		74		0.0		200	29.97	64
0910	3	25.80		7,3		5,60 0,00				7[0,0		200	29.98	76
0915		25.81		7.31		5159	,	0.90		68		0,0		200	29.98	84
0920	1	25.81		7,30		5.57		0,00		66		0.0		200	29.97	9L
0929	X	Pe	aram.	ter	5	1061	1120	d								
		10	ollect	t 5a	mply	o UA	INW	-020	-201	708	17					
							,									
ample ID:	UFMU	1-021	1-20170	8/7	Duplicate ID	N	A			QA/QC Sami	ples/ID:	NA			COC Time:	0920
Sa	mple Co	ontainer						Material Cod	des: VOA = 4	0 ml glass via	al; AG =Ambe		=Clear Glass		lene; O=Other	(Specify)
	Materia							Field Decon	tamination:		Field Filtered		COC Numbe			```
Number	Code	Volu	me Pre	servative	Intended A	nalysis and/o	or Method	Comments:		A=	1.006	7				
								L		B=	5.46	12	_			i
		AP Area T	reatability S	tudu Sama	lina Battle (Pot			0.1			KINIC .				
		Alea I	realability 5	iuuy Samp.	ing bothe :	Sei -		Groundwate	r Color is	le a	P		2			
								Signature(s	1	n						
NDICATO	RPARA	METERS	HAVE STABL	IZED WHF	13 CONSE	CUTIVE BE	ADINGS AR	F WITHIN-	0)							
0.1 for	pH:	± 3% for	Specific (onductiv	ity and To	emperatu	re: +10	my for P	edox Pot	ential-	+ 100/ 6-	Diecel	d Owner	n and T.	ledalds.	
F 1000	100	45-21-07 T (45)	10-11-67-67-67						WHYA.FUI	with oll	= 10 /6 10	DISSUIVE	SIL CYCAGE	n and rur	DIGITA	32-5

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



Page ___ of ___

NERT, Henderson, NV Project Task Name: AP Area Treatability Study Task Manager: G. Roemer Task No: M13 Well ID: UFMW-03S Field Samplers: Jeff Richeson Recorded by: Jeff Richeson Date: Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): Screened/Open Interval Top: (ft BGS) 24 (ft BMP) Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) 29 (ft BMP) Pump and Tubing Type: QED Sample Pro with Poly Tubing Pump Intake Depth: (ft BGS) (ft BMP) MP Description: TOC Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (it BMP): 26. 0 Time: GW Disposal: GW-11 Pond PURGING Temp. pН Spec Conductivity **Dissolved Oxygen** Redox Potential **Turbidity** Purge Depth to Cum. Vol. (°C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* READ CHANGE* Time READ CHANGE! READ CHANGE* READ CHANGE! READ (mVmin) (ft BMP) CHANGE* (ml) Sample ID: Duplicate ID: QA/QC Samples/ID: **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: AP Area Treatability Study Sampling Bottle Set Groundwater Color is Signature(s): *INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxvgen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centiorade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Neohelometric Units



Page ___ of ___

LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project Task Name: AP Area Treatability Study Task Manager: G. Roemer Task No: M13 Well ID: UFMW-03I Field Samplers: Jeff Richeson Recorded by: Jeff Richeson Date: Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (ft BMP): 40 Screened/Open Interval Top: (ft BGS) (ft BMP) Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) (It BMP) Pump and Tubing Type: QED Sample Pro with Poly Tubing Pump Intake Depth: (ft BGS) 35 (ft BMP) MP Description: TOC Equipment Decon. Method: 3 Bucket Rinse with Liquinox Depth to Water Before Pump Installation (ft BMP): 27,40 Time: 2629 GW Disposal: GW-11 Pond PURGING SAMPLING Temp. pH **Spec Conductivity** Dissolved Oxygen **Redox Potential** Turbidity Purge Depth to Cum. Vol. (°C) (pH Units) (uS/cm) DO (mg/L) ORP (mV) (NTU) Rate Water Purged READ CHANGE* Time. READ CHANGE* READ CHANGE* READ CHANGE* READ CHANGE* READ (ml/min) CHANGE* (ft BMP) (ml) 7.30 20,67 4.03 0,00 200 01 0700 21.0 4.03 0.00 200 27/63 16 0705 0.90 61 200 27,60 21 2.00 27,61 200 3/_ 21,4 0.90 27,58 200 21.46 0720 0.90 200 0725 0,00 38 200 0730 21/37 0.00 200 27,5 0730 03I+2017081 Sample ID: UFMW-03I-2017 0817 Duplicate ID: UFMW-03I-20170817-FD QA/QC Samples/ID: **COC Time:** Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: (Y) N Field Filtered: (Y) N COC Number: Number Code. Volume Preservative Intended Analysis and/or Method Comments: AP Area Treatability Study Sampling Bottle Set Groundwater Color is (| C a (Signature(s) 'INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 my for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mo/L - millioram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



TETRATECH

LOW FLOW CROUNDWATER CAMPLING LOC

Page	of	_
------	----	---

		2000			2.0	JVV I'L	JW Uni	DUNDN	VAIEN	SAMP	LING L	JG		N.	ERT. Henders	on, NV Projec	
Task Name	AP Are	a Treatabili	ty Study		Task Manag	јег. G. Roen	ner			Task No: M13				NERT, Henderson, NV Project Well ID: UFMW-03D			
Field Samp	ers: Jef	Richeson								Recorded by: Jeff Richeson				Date: 8/17/17			
Well Depth (ft BGS): MP Distance AGS (ft): Well Depth										Screened/Open Interval Top:				(It BGS)		15 (It BMP)	
Well Diameter (in): 2 PID/FID Readings Beneath Inner Cap (ppm cge akb):											Screened/Open Interval Bottom:						
Pump and Tubing Type: QED Sample Pro with Poly Tubing Pump Inta										(ft BGS) 47.5 (ft BMP)				(ft BGS)		60 (ft BMP)	
									fater Before Pump Installation (if BMP): 37,49						IP Description: TOC W Disposal: GW-11 Pond		
		Temp.		pH		S 0-								GW Dispose	II. GVV-11 Pond	1	
	PURGING		emp. (°C)		Units)	Spec Conductivity (uS/cm) READ CHANGE*		DO (mg/L)		Redox Potential ORP (mV)		Turbidity (NTU)		Purge Rate	Depth to Water	Cum. Vol. Purged	
Time	A PA	READ	CHANGE*	READ	CHANGE*												
Time		7	OTANGE		CHANGE		CHANGE	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)	
055	70	21,97		7.54		4,77		1,56		119.		19.8	1	200	7.49	0	
0600	-	23.05		7.37		4.81		0,26		114		0.8		200	27,68	11	
0605	X	23,15		7,35		4.81		0,06		110		0.6		200	27,70	aL	
0610	X	23.19	7	7.32		4.81		0.00		103	1	0.5		1 -	27,67	3(_	
6615	X	23,2		7.30		4.84		0.00		de		1 _		200		111	
0620	X			7.29		U d	7	0.00		66	-	0,3		200	27,69	46	
0625	V	33.25 33.27		7.29		11 0				90		0,4		200	27.70	54	
		23.26				7, 73		0.09				0,3		200	27.70	6	
9630				7.29		4,7)		0,00		86		2.2		200	27,68	76	
0635	1 "	23.26		7.30		4.95		0.00		84		0.3		200	27,67	84	
0635	X		rame +	2/5	State	11/20											
		Co	llect	Samp	e u	FMW-	730-29	17081	7								
-					1												
Sample ID:	FM	11-03	0-20170	17	Duplicate ID:		1/1					- /	4				
Sa	mnle Co	ntainer	1017	181/	Duplicate ID.	$-\nu$	17	Tunio 10		QA/QC Sam		NI	7		COC Time:	0635	
Sample Container Material								Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: (Y) N Field Filtered Y N COC Number:									
Number	Code		ne Pres	servative	Intended A	nalysis and/o	or Method	Comments:		(Y) N	4	12000	COC Number	:			
						you and		Johnments.		1	1= 7	. 135					
								1		· ·	3 - 8,	4/8					
AP Area Treatability Study Sampling Bottle Set									Groundwater Color is (lear)								
										ر در در	R	1					
								Signature(:	s):	/	/ /	~				J	
NDICATO	PARA	METERS	HAVE STABL	IZED WHEN	3 CONSEC	CUTIVE RE	ADINGS AR	E WITHIN:		- 6							
± 0.1 for	pH:	± 3% for	Specific C	onductiv	ity and To	mperatu	re: ±10	my for R	edox Pot	ential:	± 10% for	Dissolv	ed Ovuce	n and Tree	hidite		
DOD	Delaur	Sansand David			CHAT MILL VIOLEN		M - C. C. C. C. C. C. C. C. C. C. C. C. C.					- DIGGUIV	AN AVARIE	THE PERSON	DIGITAL.		

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



LOW ELOW COOLINDWATER CAMPLING LOC

<u> </u>					L	JVV FL	IV GH	ועעווטט	AICH	SAMPL	.IIVG LC)G		NE	ERT, Henderso	on, NV Project
Task Name	AP Are	a Treatabilit	y Study		Task Manag	er: G. Roem	er			Task No: M	13			Well ID: UF	MW-04S	
Field Sampl		Richeson								Recorded by	: Jeff Riches	on		Date:	8/16/1	フ
Well Depth				istance AGS (<u> </u>			(ft BMP): 29		Screened/O	pen Interval T	ор:		(ft BGS)	24	4 (ft BMP)
Well Diame				ID Readings I	Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval E	lottom:		(ft BGS)	29	9 (ft BMP)
			ample Pro with				Pump Intake			(ft BGS)		27.5	(ft BMP)	MP Descripti	ion: TOC	
Equipment I	Decon. M	ethod: 3 Bu	icket Rinse wil	th Liquinox			Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	26,79	7 Time: g	261/	GW Disposa	l: GW-11 Pond	
	g 8	To	emp.	р	Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox I	Potential	Turb	idity	Purge	Depth to	Cum. Vol.
	PURGING		(°C)	(pH t	Jnits)	(uS	/cm)	DO (I	ng/L)	ORP	(mV)	(N	ru)	Rate	Water	Purged
Time	S &	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0825	X	27.45		7,35		4,08	İ	1.50		160		49.9	-	100	20,79	0
0830	X	27,40		7,39		4.83		0.89		163		32.	7	100	26.89	500.
0835	X	27,30		7,27		4,66		0,22		150		0.00		100	26.93	14
0840	8	27,20		7,24		4.65		0.21	-	151		0,00		100	26.94	1.54
0845	X	27.09		7.22		4.62		0.20		152		0.90		100	26,94	26
0850	X	27,00		7,20		4,60		0.18		150		0.00		190	26.94	2.5%
0850	X		aran		5	Stab	. /, -	20		7 7 (4		.08		100	0-0.7	4,7/
0009	1	6	Mark		ingl	7	FML		(-)	170	816			1	+	
		<u> </u>	IIIC CT	>	17791	- 4	7-10	7- 57	2 09	01 70	210			+		
														-		
	+-+													-		
														ļ		
							<u> </u>									
														-	1	
	 															
	-		1 015	> ==001/												
Sample ID:	3		W-045-	20170816	Duplicate ID	: 4	114	l la compan		QA/QC Sam		NIA			COC Time: △	/
- 5	mple Co Materia														ylene; O=Other	(Specify)
Number	Code		me Pre	eservative	Intended A	Analysis and/	or Method	Comments:		(Y) N	Field Filtered		COC Numbe	<u>∍r:</u>		
					WILDINGOG !	maryon and	or moniou	Collinierita.	•		_	= 1,11	-			
											_ B	= 6,6	75			
		AP Area 1	reatability S	Study Samp	ling Bottle	Set		Groundwate	er Color is	Clea						
											7	0.				
								Signature	s):	1						
			HAVE STAB						Secretary Secretary	(587,200 58	UNES AG	522	-	C	
± 0.1 for	pH:	± 3% for	Specific	Conductiv	vity and T	emperati	ure. ± 1	<u>0 mv fo</u> r F	ledox Po	tential:	± 10% fo	r Dissolv	ed Oxyae	en and Tu	rbidity	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



10					LC	W FLC	DW GR	OUNDN	/ATER	SAMPL	.ING LC	OG		NE	ERT, Henders	on, NV Project
Task Name:	AP Are	a Treatability	y Study		Task Manag	er: G. Roem	er			Task No: M	l13			Well ID: UF	MW-04I	
Field Sample	ers: Jeff	Richeson								Recorded b	y: Jeff Riches	ion		Date:	2/16/1	7
Well Depth (ft BGS):	:	MP Di	stance AGS ((ft):		Well Depth ((ft BMP): 39		Screened/O	pen Interval T	ор:		(ft BGS)	. 3	4 (ft BMP)
Well Diamete	er (in): 2	2	PID/F	ID Readings i	Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval B	Bottom:		(ft BGS)	3	9 (ft BMP)
Pump and T	ubing Ty	/pe: QED Sa	ample Pro with	Poly Tubing			Pump Intake	e Depth:		(ft BGS)		37.5	(ft BMP)	MP Descripti	on: TOC	-
Equipment C	econ. M	Method: 3 Bu	icket Rinse wit	h Liquinox			Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	26.81	Time:	06/2	GW Disposal	l: GW-11 Pond	i
	PURGING	T	emp. (°C)	(pH l	H Units)	(uS	nductivity /cm)	DO (r	ng/L)	ORP	Potential (mV)	(N	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	N S	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0740	X	26.70		7.44		4.31		1.77		130		480		200	26,81	0
0745	X	26.69		7.42		4.55		0.72		119		154		200	27,01	16
0750	X	26.68		7.40		4.57		0.21		102		12,4		200	27.00	21
255	X	26.70		7,37		4.59		0,00		85		3.6		200	27,01	34
0800	X	26,70		7.24		4,63		0.00		83		3.3		200	27,02	46
0805	X	26.69		7,23		4,63		0.00		78		3.0		200	27.03	52
0810	X	26.65		7.28		4,66		0.00		73		2.8		200		61
0815	X	26.65		7,32		4,67		0,00	. 9	68,		2.5		200	17.03	
9815	×		aram		a	chied		Stat	21/17	atio				9 9 9		
_F_D_I.J_			ollect	2	mol	0 1,5	MG.	047)0	1708	7/1					
)-1			7		0	7.0.0						
-												-				
												-				
																·
Sample ID:	UF	MW-01	41-201	70810	Duplicate ID	*		99999		QA/QC San	ples/ID:			Į.	COC Time:	0815
Sa	mple C	ontainer					e obsus								ylene; O=Othe	
Maria	Mater			45					ntamination:/	y) N	Field Filtered	: (Y) N	COC Numbe	er:		
Number	Code	e Volu	me Pre	eservative	Intended A	Inalysis and	or Method	Comments				4=	1,00	3		
		+				 						7-	2.04	'		
		AP Area 1	Freatability S	Study Samp	l	Set		Groundwat	er Color is	clear		0 -	017/	/		
									/	2	R	R	_			
							•	Signature		1						
			HAVE STAB							-	5-20-0-20	7000 W1	OW.	10000	27 1234	1
± 0.1 for	pH:	± 3% for	Specific	Conducti	vitv and T	emperat	ure: ±1	0 mv for F	Redox Po	tential.	± 10% fo	r Dissolv	ed Oxva	and Tu	rbidity	

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute m1 - milliliter

MP - Measuring Point NTU - Nephelometric Units





					LC)W FLC)W GR(OUNDN	/ATER	SAMPL	.ING LC)G		NE	RT, Henders	on, NV Project
Task Name:	AP Are	a Treatability	Study		Task Manag	er: G. Roem	er			Task No: M	13			Well ID: UF	MW-04D	
Field Sample	ers: Jeff	Richeson								Recorded by	y: Jeff Riches	on		Date: 8	116/1	7
Well Depth (ft BGS):		MP Di	stance AGS (ft):	*	Well Depth ((t BMP): 50		Screened/O	pen Interval T	ор:		(ft BGS)	4	5 (ft BMP)
Well Diamete	er (in): 2)	PID/FI	D Readings 6	Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval B	ottom:		(ft BGS)		60 (ft BMP)
Pump and To	ubing Ty	pe: QED Sa	mple Pro with	Poly Tubing			Pump Intake	•		(ft BGS)		47.5	(ft BMP)	MP Descripti		
Equipment C	econ. M	ethod: 3 Bu	cket Rinse wit	h Liquinox			Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	26,79	Time:	06/3	GW Disposa	l: GW-11 Pond	1
	PURGING SAMPLING	Te (emp. *C)		H Jnits)		nductivity /cm)	THE STREET, SAME	d Oxygen mg/L)		Potential (mV)	The state of the s	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	P. SAN	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0630	X	26.40		7.17		5.06		1.37		154		241		300	26.78	0
0635	X	26.61		7,23		5.19		0./6		138		6.0		200	76.99	11
0640	X	26.64		7.24		5.11		0,04		130		3.6		200	27.03	26
0645	X	26.66		7.26		5.11		0.99		115		2,7		200	27.02	34
0659	X	26,69		7.45		5.12		0.00		86		2.2		200	27.00	
0655	X	26.68		7.44		5.12		0,00		82		1.9		200	27,02	52
0700	X	26.69		7.42		5,12		0.00		79		1.7		200	27.03	64
0705	X	26.69		7.42		5.12	_	0.00	-	75		1.8		200	27.02	74
0705	X		rame	ters	OC.	hieve	0	stab.	1/5	tio						
			lect	San				40-2	21709	716	,					
			116-0-1	75.2				10								
							-									-
Sample ID:	UFN	W-041	1-20170	816	Duplicate ID): /	VIA		1	QA/QC San	ples/ID:	NA			COC Time:	
Sa	mple C	ontainer				din san						er Glass; CG			ylene; O=Othe	r (Specify)
The library	Materi		THE STATE OF							(Y) N	Field Filtered		COC Number			
Number	Code	Volu	me Pre	eservative	Intended A	Analysis and	or Method	Comments	:	ST 12		A=	- 1.3	142		
											_	R=	5,	770		
		AP Area 1	Freatability S	Study Sami	olina Bottle	Set		Groundwat	ter Color is	Clea		<i>-</i>	J	, , ,		
-		AI AIGA	Toatability	otady carry	James Dottle			- Contana		1-1	2 12		•			
								Signature	(s):	1/	1 R	12	_			
*INDICATO	R PAR	AMETERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RI	EADINGS A	RE WITHIN:								
+ 0.1 for	nH·	+ 3% for	r Specific	Conducti	vity and T	emperat	ure: +1	0 my for l	Redox Po	tential:	+ 10% fo	r Dissolv	ed Oxya	en and Tu	rhidity	

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



ask Name: Af ield Samplers: Vell Depth (ft B Vell Diameter (i ump and Tubin quipment Deco	Jeff F GS): in): 2 ng Type	icheson e: QED Sar hod: 3 Buc	MP Dis PID/FI mple Pro with	Poly Tubing h Liquinox			Well Depth (It BMP): 30		Task No: M Recorded by Screened/O	: Jeff Riches			Well ID: UF Date: (ft BGS)		25 (ft BMP)
Vell Depth (ft B Vell Diameter (ump and Tubii quipment Dec	GS): in): 2 ng Typo on, Mei	e: QED Sar hod: 3 Buc Te r	PID/FI mple Pro with cket Rinse with	ID Readings E Poly Tubing th Liquinox			ge akb):	t BMP): 30							2)5 /ft BMD
Vell Diameter (ump and Tubii quipment Dec	in): 2 ng Type on. Mei	hod: 3 Buc	PID/FI mple Pro with cket Rinse with	ID Readings E Poly Tubing th Liquinox			ge akb):	t BMP): 30		Screened/O	pen Interval T	UD.		# PGCI	2	75 /ft BMD
ump and Tubir quipment Dec	ng Type on. Mel	hod: 3 Buc	mple Pro with ket Rinse with	Poly Tubing h Liquinox	Beneath Inner							-F-		(It DOS)		~ (it DiML)
quipment Deci	on. Mel	hod: 3 Buc	ket Rinse wit	h Liquinox			Pump Intako			Screened/O	pen Interval B	ottom:		(ft BGS)	3	30 (ft BMP)
		Ter					Louis unave	Depth:		(ft BGS)		27.5	(ft BMP)	MP Descripti	on: TOC	
SNS	AMPLING		mp.	·			Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	27.19	Time: O	605	GW Disposa	: GW-11 Pon	d
2	AMPL	(*			Н		nductivity			The second section of the second	otential		idity	Purge	Depth to	Cum. Vol.
		READ	CHANGE*	(pH L	Units) CHANGE*	READ	(cm)	DO (r READ	mg/L)	READ	(mV)	(NT READ	CHANGE*	Rate (ml/min)	(ft BMP)	Purged (ml)
			CHANGE	neau	CHANGE		CHANGE		CHANGE		CHANGE		CHANGE			
0530 X		17,40		711		6,95		1.45	-	150		156		100		01
1535 (7.30		7.18		6,99		0,75		148		191		100	27.25	
25 40 X		רבינו		7,18		6,80		0.40		146		75.3		100	27.30	
0545 8		27,20		7,19		6,75		0,35		145		9,4		100	27,32	1.52
0550 X		27.17		7.19		6,72		0.33		144		7,2		100	27,34	26
2555 7		17.14		7,10		6.72		0.31		145		6.8		100	27,35	251
2609 X		17.13		721		6.72		0,30	-	145		6.4	-	100	27,35	34
2600	X		ram	efer 5	ac	hier	red	Stab	liza	tio-	Ţ	7				
		Coll	ect	San	0/0	UFA	111-	047	0/70	811						
				1		VI.1. 2.		-30		76						
	11											-				
										-						
	++										-					
	+-+							-					1			
ample ID: 🕡	East	1 255	- >0/7	18/16	Duplicate ID): /	NA			QA/QC Sam	nles/tD·	1// 1			COC Time:	06.00
Same	ole Co	ntainer	3017	1010	Dapitotic to		1/4	Material Co	ndes: VOA = 4		•	er Glass: CG	=Clear Glass	: PE=nolveth	ylene; O=Othe	
	latenal	_							ntamination:		Field Filtered		COC Numbe		Jiono, 0-00	. (Opos.))
Number	Code	Volum	e Pre	eservative	Intended /	Analysis and/	or Method	Comments					80			
											B=	2 3	47			
										1/10	7/	$\neg i \cup i$	7 /			
	Α	P Area Ti	reatability S	Study Samp	oling Bottle	Set		Groundwate	er Color is	clea	•		-			
		The same of the sa	\rightarrow							11	7 R	0	ST-DOMESTIC CO.			
NDIGATOS	241241	METERS:	LANE OT 15	UZED MESS	110 001:05	OUTUE ST		Signature		10		/				
NDICATOR I <u>• 0.1 for bl</u>																

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



						,,, , <u> </u>	on an	SOILD	MILII	OMINII I	LIITU LU	ď		N	±HI, Henders	ion, NV Project
Task Name	e: AP Area	Treatability	/ Study		Task Manag	er: G. Roei	mer			Task No: N	A13			Well ID: UF	MW-051	
Field Samp	plers: Jeff F	Richeson								Recorded b	y: Jeff Riches	on		Date: 53	16/17	7
Well Depth	n (ft BGS):		MP Dis	stance AGS	(ft):		Well Depth (ft BMP): 40		Screened/C	pen Interval T	op:		(ft BGS)	3	5 (ft BMP)
Well Diame	eter (in): 2		PID/FII	D Readings	Beneath Inner	r Cap (ppm	cge akb):			Screened/C	pen Interval B	ottom:		(ft BGS)	4	0 (ft BMP)
Pump and	mp and Tubing Type: QED Sample Pro with Poly Tubing						Pump Intake	Depth:		(ft BGS)		37.5	(ft BMP)	MP Descript	ion: TOC	
Equipment	Decon. Me	thod: 3 Bu	cket Rinse with	Liquinox			Depth to Wa	ter Before Po	ump Installatio	on (ft BMP):	27,07	Time:	0606	GW Disposa	il: GW-11 Pond	i i
	JRGING		emp. (°C)		oH Units)	- 100 and 100 and 100	onductivity S/cm)	2100112	ed Oxygen (mg/L)	32.0100.0774	Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
_		DEAD	CHANGE*	DEAD	CHANGE	DEAD	CHANGE	DEAD	CHANCE	DEAD	CHANCE	DEAD	CHANCE	(ml/min)	/# RMP\	(ml)

	PURGING SAMPI ING	T	emp. (°C)		oH Units)	The second secon	nductivity /cm)		d Oxygen mg/L)	53 814100 2004 4004	Potential (mV)	CONTRACTOR AND ADDRESS OF	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	15 18	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0420	X	76,67		7,36		5.12		1,29		36		230		200	27,07	0
0425	X	26,79		7,35	Ţ	5.15		0.71		13		74.9		200	27,19	16 -
0430	X	26.73		7,24	ļ	5,09		2.34		16		5.9		200	27,25	24
0435	X	26,7/		7,21		508		0,26		12		3,6		200	27,29	32
0440	X	26,75		7,20		5.09		21/7		13		3,0		200	21,31	44
0445	X	26.79		7.18		5:19		0.03		12	-	3,4		200	27,3	11
0405	X	db, 8]		7.18		3,09		0.02	-	11		5.6	-	200	21.31	64
0435		26,77		1119		2008		0,01				3.3		200	27, 32	- 1
0500		26.77		DIL		3.98		0.00			1.	de /	1.	200	27,33	84
07 00	+	pa	ram.	ere/	7/	9011	760	(3	Con	5000	chicp	1ca	119	5		
		12	21166:	50	angi	P U,	LMU	-05-	L-00	110	0/6					
-	+-+-								1							
	111							<u>-</u>								

Sample ID:	UFMU	1-05I-	20170816	Duplicate ID:	14	QA/QC Samples/ID: V/A COC Time: 0500
Sa	mple Cont	ainer			11800	Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify)
	Material	HILITARIES I				Field Decontamination: N Field Filtered: N COC Number:
Number	Code	Volume	Preservative	Intended Analysis and	d/or Method	Comments: $A = 0.616$
						' ' - ' - '
						100 B= 4,420
	AP	Area Treata	bility Study Samp	oling Bottle Set		Groundwater Color is Clear B= 4,920
						mm R D
						Signature(s):
*INDICATO	R PARAMI	ETERS HAVE	STABLIZED WHE	N 3 CONSECUTIVE P	READINGS AF	RE WITHIN:

± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 my for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity **BGS - Below Ground Surface**

BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



					L	JVV FL	JW GH	UUNUN	VAIEK	SAMP	.ING L()G		N	ERT. Hender	son, NV Project
		ea Treatabili	ty Study		Task Manag	ger: G. Roen	ner			Task No: N	113		·	Well ID: UF		
Field Sampl										Recorded b	y: Jeff Riches	son	<u> </u>	Date:		
Well Depth				istance AGS				(ft BMP): 50		Screened/C	pen Interval 1	Гор:		(ft BGS)	4	45 (ft BMP)
Well Diame	1 /			ID Readings		r Cap (ppm c	ge akb):			Screened/C	pen Interval E	Bottom:		(ft BGS)	1	50 (ft BMP)
			ample Pro with				Pump Intak	e Depth:		(ft BGS)		47.5	(ft BMP)	MP Descripti	ion: TOC	(,
Equipment (Decon. N	lethod: 3 B	ucket Rinse wil	th Liquinox			Depth to Wa	ater Before Pu	mp Installatio	n (ft BMP):	26,8	7 Time:	0607		l: GW-11 Pon	ıd
	PURGING	Т	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turl	oidity	Purge	Depth to	Cum. Vol.
			(°C)	(pH I	Units)		/cm)	DO (i	mg/L)	ORF	(mV)		TU)	Rate	Water	Purged
Time	15/8	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1255	X	28.01		7.23		13./7)	1,70		154		82,0		200	26.86	0
1399	X	27.64		7,21		6.55		0,25	1	155		8.9		200	27,05	
1305	X	27.56		7.18		6,54		0,05		150		1.5		200	27.10	1
1310	X	27,48		7,17		6,53		0.00		138		2.9		~	27,12	31
1315	X	27.51		7.15		6,5		0.00		130				200		477
1320	X	27.51		7.16		6,48		0.90		7		0.5		200		54
1325	X	27.49		7,20		6.47		0.00		124		0,4		200		
	Y	5.	arami	tor	c c.		130	1	2		1	-	7 -		27.13	62
1325		- 17	Lect		7	Tabil	1200				util	1	odin	95)		ļI
		601	17.6./	San	אומר	UFA	1W-0	50-20	1 108	15						
		-			-											
					_											
																<u></u>
Sample ID:	UFMI	1-051	7-20170	815	Duplicate ID	· N	11			QA/QC Sam		NA	-		COC Time:	
Sa	Materi	ontainer				'	·	Material Co	des: VOA = 4						/lene; O=Othe	r (Specify)
Number	Code		me Pre	servative	Intended !	Analysis and/o	or Mathad			Y) N	Field Filtered		COC Number	r:		
	0000	1 70,01	1 10	301401140	interioed /	inalysis artur	N MELIIOG	Comments:			A=		45			- 1
											B	2,3	3/6			- 1
		AP Area T	reatability S	tudy Samp	ling Bottle	Set		Groundwate	er Color is	Clea		10				- 1
										100	107		R			
								Signature(s):	-4		- /				
INDICATO	R PARA	METERS	HAVE STABL	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF	RE WITHIN:			U					
± 0.1 for	pH:	± 3% for	Specific (Conductiv	itv and T	emperatu	re: ±10	mv for F	Redox Pot	ential:	± 10% for	r Dissolv	ed Oxyge	n and Tur	hidity	

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units



TETRATECH

LOW ELOW COOLINDWATED CAMPLING LOG

					LC	YYY FL	W Uni	DUNDI	AIEN	JAIVIPL	.IIVG LC	/G		NE	ERT, Henders	ion, NV Project
Task Name:	AP Area	a Treatability	y Study		Task Manag	er: G. Roem	er			Task No: M	13			Well ID: UF	MW-06S	
Field Sample	rs: Jeff	Richeson								Recorded by	y: Jeff Riches	ion		Date: 5	3/15/1	7
Well Depth (t BGS):		MP Di	stance AGS (it):		Well Depth (ft BMP): 30		Screened/O	pen Interval T	op:		(ft BGS)	2	25 (ILBMP)
Well Diamete	er (in): 2	2	PID/FI	ID Readings E	leneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval B	lottom:		(ft BGS)	3	30 (ft BMP)
Pump and Ti	ibing Ty	pe: QED Sa	ample Pro with	Poly Tubing			Pump Jatake	e Depth:		(It BGS)		27.5	(ft BMP)	MP Descripti	on: TOC	
Equipment D	есоп. М	ethod: 3 Bu	ucket Rinse wit	h Liquinox			tienith to Wa	iter Before Pu	mp Installatio	on (ft BMP):	26.8	7 Time:		GW Disposal	l: GW-11 Pond	d
	a S	₽ To	emp.	р	H	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turk	idity	Purge	Depth to	Cum. Vol.
	8 2		(·c)		Inits)		/cm)	LONG TO LONG	mg/L)	ORP	(mV)	(N	TU)	Rate	Water	Purged
Time	PURGING SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1115	X	31,67		6.92		5.46		1.75		235		0.0		100	26.87	0
1120	X	29,94	4	6.91		5,49		0.80		217		516		100	27,03	500
1125	X	29.46		6.91		5.47		0.57		205		205		100	27,12	11_
1130	X	29.17		6.91		5.48		2,27		193		89,7		100	27,12	1.5 L
1135	X	29.12		6.92		5.48		0.14		185		61.5		100		2 L
1140	X	29,07		6.95		5.47		0.03		181		43.1		100	27.//	1.5L
1140	X	29,07		6.99		6.47		0.00		181		36.4		100	27.11	31
1159	X	29,05		7,02		5.45		0.00		182		28,3		100		3,56
1155	X	29,09		7.05	-	e.41		0.00		182		25.9		100	27.12	
1200	X	2911		7,06		5.46		0.00		183		24,6		100	27.12	4 4
1205	X	11.66		7,97		/		0,00		182		23. /		100	27,12	
1205	X		ranet	115	Stab	1/120	1		20500		UP 1	Read	250	1		
		13/1	set !	Samp	6	FMU	1-06	- 10	1708	1		46620	/			
		Calif	G1		/(, , , , ,		00	700							
							-									
Sample ID:	IJEM	W-06	5-20170	815	Duplicate ID	: N/	A	1		QA/QC San	ples/ID:	NA			COC Time:	1205
		ontainer						Material Co	odes: VOA =	40 ml glass v	ial; AG =Amb	er Glass; CG	=Clear Glas	s; PE≃polyeth	ylene; O=Othe	r (Specify)
	Materi							Field Deco	ntamination;	Y) N	Field Filtered	N	COC Number	317		
Number	Code	yolu Volu	me Pre	eservative	Intended /	Analysis and	or Method	Comments	:			A=	1,13	9		
	-							[]				RI	0 97	9		
		AP Area	Treatability S	Study Same	ling Bottle	Set		Groundwal	er Color is	clea		V	V101	/		
		Al Alea	Treatability	otady camp	ning bottle	001		Ciobilana	ici odioi is	no	7 1		2			
								Signature	(s):	/		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u> </u>		
'INDICATO	R PAR	AMETERS	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE RI	ADINGS A			-						
± 0.1 for	pH:	± 3% fo	r Specific	Conducti	vity and I	emperat	ure: ±1	0 my for l	Redox Po	tential:	± 10% fc	r Dissolv	ed Oxva	en and Tu	rbidity	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units



TETRATECH

Page	_	of	_
------	---	----	---

					LC	OW FLO	OW GR	OUNDY	VATER	SAMPL	.ING LC)G		NE	ERT, Henders	son, NV Project
Task Name	AP Are	a Treatabilit	y Study		Task Manag	jer. G. Roem	er			Task No: M	113			Well ID: UF	MW-06I	
Field Sampl	ers: Jeff	Richeson								Recorded by	y: Jeff Riche:	son		Date: 8	11511-	7
Well Depth	(ft BGS):			stance AGS (•		Well Depth	(ft BMP): 40		Screened/O	pen Interval 1	Гор:		(ft BGS)		35 (ft BMP)
Well Diamel	ter (in): 2	2	PID/F	ID Readings B	Beneath Inne	r Cap (ppm c	ge akb):			Screened/O	pen Interval 6	Bottom:		(ft BGS)		40 (ft BMP)
<u> </u>		` 	ample Pro with	-			Pump Inlake			(ft BGS)		37.5	(ft BMP)	MP Descripti	ion: TOC	
Equipment (icket Rinse wil	h Liquinox			Depth to Wa	ater Before Pu	ımp Installatio	n (ft BMP):	26.89	7 Time: C	2557	GW Disposa	il: GW-11 Pon	d
	PURGING	To	emp. (°C)	(pH t	H Jnits)	(uS	nductivity /cm)	DO (i	d Oxygen mg/L)	ORP	Potential (mV)	(N	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	15 S		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
2915	X	27,26		6.98		5.78		1.50		283		1513		200	26.89	0
0920	X	26.88		7.22		5.67		1.00		24/		0.6		200	27.02	1
0925		26.79		7.24		5.67		0.74		220		0.0		200	27,04	26
0930	X	26,91		7.25		5.69		0.62		200		0.0		200	27.04	36
0935	X	26.35		7,23		5.74		0.57		195		0.0		200	27.03	46
0940	X	26.25		7.18		5.73		0.54		190		0,0		200	27,05	54
0945	X_{\perp}	26.65		7.18		5.71		0.51		185		0.0		200	27,00	66
0945	X	pa	rame	ter5	Sta	6/1	red	63	cons	ecur	fice 1	read	195			
•		Col	Vect	Sami	0/0	UFM	W-06	Z-201	1			1W-06.	I-201	7081	5-F	b
														100 - 100 - 100 B		
Sample ID:	UFM	W-061	C-2017	0815	Duplicate ID	: UFMW	-06I-2	0170815	-FD	QA/QC Sam	ples/ID:	N	14		COC Time:	0945
		ontainer						Material Co	odes: VOA = 4				≠Clear Glass	; PE=polyeth	ylene; O=Othe	r (Specify)
	Materi							_	ntamination: (N (Y)	Field Filtered	t: Y N	COC Numbe	ir.		
Number	Code	Volu	me Pre	servative	Intended /	Analysis and/	or Method	Comments	•			4	-).	175	name.	
										_		77	1	, , , , ,	9	
	<u> </u>	AP Area 1	Freatability S	Study Samp	ling Bottle	Set		Groundwat	er Color is	clea		n t	3=4	175	,	
		-						Signature	(e)·	pr		\ 1				· .
*INDICATO	R PAR	AMETERS	HAVE STAB	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS A	A CONTRACTOR OF THE PARTY OF TH	and the same of th	6						

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter

± 0.1 for pH: ± 3% for Specific Conductivity and Temperature: ± 10 mv for Redox Potential: ± 10% for Dissolved Oxygen and Turbidity MP - Measuring Point NTU - Nephelometric Units



TETRA TECH

LOW FLOW GROUNDWATER SAMPLING LOG

Page	of	_
------	----	---

NERT, Henderson, NV Projec

$\overline{}$			- 65		28				77170011	~ /	mra L			INC	:HI, Henders	on, NV Project
Task Name:			y Study		Task Manag	er: G. Roem	er			Task No: N	113			Well ID: UF	MW-06D	
Field Sampl	ers: Jeff	Richeson								Recorded b	y: Jeff Riches	son		Date: 8	115/1	7
Well Depth	ft BGS):		M	P Distance AGS	(ft):		Well Depth	(ft BMP): 50		Screened/O	pen Interval 1	Гор:		(ft BGS)	4	5 (ft BMP)
Well Diamet	er (in): 2	2	P	ID/FID Readings I	Beneath Inne	r Cap (ppm c	ge akb):			Screened/O	pen Interval E	Bottom:		(ft BGS)	5	
Pump and T	ubing Ty	pe: QED S	ample Pro	with Poly Tubing			Pump Intake	e Depth:		(ft BGS)	•	47.5	(ft BMP)	MP Description	on: TOC	
Equipment (econ. M	lethod: 3 Bu	ıcket Rins	e with Liquinox			Depth to Wa	iter Before Pu	ımp Installatio	n (ft BMP):	27,23	Time:	0600	<u> </u>	I: GW-11 Pond	
	m O	T	emp.		Н	Spec Co	THE RESIDENCE OF THE PERSON NAMED IN	Dissolve			Potential		oldity	-		
00	15 E	1	(°C)		Jnits)		/cm)		mg/L)		(mV)		TU)	Purge	Depth to Water	Cum. Vol.
Time	PURGING SAMPLING	READ	CHANG		CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Rate (ml/min)	(ft BMP)	Purged (ml)
	X	27,80		7,22		6.39	0.0.0.0		Onnide		OTANGE		CHANGE			
0755	X							1,52		183	-	170	ł	200	27,23	0
0800		27.08		7,26		6,45		0.70	ļ	180	-	17.5	-	200	27,39	14
2805		26.98		7.28		6,47		0.72		178		5,3		200	27,40	26
0810	X	26.71		7,27		6,50		0.70		177		1.9		200	27,38	3L_
0815	X	26.61		7,27		6,52		0.71		178		1.7		200	27,39	46
0815	ヒメ	Pa	ran	reters	a	chiev	ed	Stabi	1120	tron				Gan		
2815 X Parameters othieved stabilization,																
	Collect Sample CIFMW-06D-20170815															
																- 2019
										<u> </u>						
				1												
								_								
Sample ID:	UFA	1W-0	61-2	10170815	Duplicate ID	:				QA/QC Sam	ples/ID:	n 5/1	15/5		COC Time: g	815
Sa		ontainer													/lene; O=Other	(Specify)
	Materia										Field Filtered		COC Numbe	r.		
Number	Code	Volur	me I	Preservative	Intended A	Analysis and/o	or Method	Comments		_	& had	m. /	4-	1,031		
											W LINES	The (1	IT V) I		
		AD Aros T		tu Studu Sama	lina Dattia	C-L				- (R had	· //	7)-	0,92	3	
		Ar Area I	reatabili	ty Study Samp	ung Bottle	Set		Groundwat	er Color is	Cled	FI	ו) אינרים ישה	/-	0,10)	
		-						Cinnatura	(a)	200		R				Ī
INDICATO	R PAR	METERS	HAVE ST	ABLIZED WHE	M 3 CONSE	CLITIVE DE	ADINGS AS	Signature	(S):	1		_				
				ic Conductiv						lantiali	. 100/ =-	n Dianele			de falte.	
_ 0, 1 101		9 /0 101	00001	IN AALIAMATI	THE GILL	emberatt	11 T. T. II	A THE TOP I	JEUUX PO	enual:	± 10% 10	LINISSOIA	ed UXVde	n and Lur	DIGITY	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute mt - milliliter MP - Measuring Point NTU - Nephelometric Units

REGION	Soil Flus	hina IRM -	- Daily/Bi-Weekly GW Gauging Form
Project Name:		Task K01 - Soil Flu	
Address:		, Henderson, NV 8	
1	K. House		Gate Access Code: 093,
Technician:	UNNY E	750	
		/>-	
Monitoring W	ells	Total Donth of	
Well ID	Depth to Water (ft btoc)	Total Depth of Well (ft btoc)	Notes (well condition, etc.)
		1 (10 000)	PLOT 1 (NORTH)
Injection Well	S		
UFIW-01S			
UFIW-011	ļ <u> </u>		
UFIW-01D			
UFIW-02S UFIW-02I	 		
UFIW-02D	+	 	
UFIW-03S	1	 	
UFIW-031	 	 /	<u> </u>
UFIW-03D			
UFIW-04S		1	
UFIW-04I		L	
UFIW-04D			
Monitoring We			
UFMW-01S	Dry	1105	
UFMW-01I	29/38	1106	
UFMW-01D	29.53	1107	
UFMW-02S	Dry	110	
UFMW-02I UFMW-02D	30,/21	((()	
UFMW-02D	30,24	107	
UFMW-031	DNY 28/73	1115	
UFMW-03D	28.77	11/6	
Extraction Wel		1. 114	
E1-1	29.68	0825	
E1-2	41, 22	0 828	
E1-3	39.50	0832	
			PLOT 2 (SOUTH)
Injection Wells			
UFIW-05S			
UFIW-051 UFIW-05D			
UFIW-06S			
UFIW-061			
UFIW-06D			
UFIW-07S			
UFIW-07I			
UFIW-07D			
UFIW-08S			
UFIW-08I			
UFIW-08D			
Monitoring Wei		=	
UFMW-04S UFMW-04I	28.37	1653	
UFMW-04D	28,49	1054	
UFMW-05S	29,01	1055	
UFMW-051	28,90	1057	
UFMW-05D	18,70	1058	
UFMW-06S	28,38	1059	
UFMW-06I	28,46	1100	
UFMW-06D	28.75	101	
xtraction Well	S		
E2-1	42:57	0924	
E2-2	40.70	0945	
E2-3	39.74	0954	
E2-4	40.34	1007	
E2-5	43,44	1017	

Task Name	AP	AreaT	reatabili	HOVR U	Task Manag	ger: G. F	WINE			Task No:	MIZ			Well ID: //F	MW-OIS	
Field Sampl	ers: \) Kead	<u> </u>	1						Recorded b	y: D.	Kead		Date: 0/		
Well Depth			MP Di	stance AGS			Well Depth	(ft BMP):	9	Screened/C	pen Interval 1			(ft BGS)	24	(ft BMP)
Well Diamet		2_	PID/F	D Readings	Beneath Inne	r Cap (ppm co					pen Interval E	Bottom:	~	(ft BGS)	7 9	(ft BMP)
Pump and T							Pump Intake			(ft BGS)				MP Description		
Equipment (Depth to Wa	iter Before P	ump Installatio	n (ft BMP):	DRY	Time: {[Q (6/14)	GW Disposal	: —	710
:	PURGING SAMPI ING	7	(°C)	(pH	H Units)		nductivity (cm)		ed Oxygen (mg/L)	The state of the s	Potential (mV)		bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	2 3	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
WE	LL	085	ERVE	> To	_\$E	RY;	UNAB	LE -	18 57	TMPL	E.					
													137			
				<u> </u>							<u> </u>			75		
<u> </u>	Mater	_ I			Duplicate ID		II _{FIII}	Material Co			•		=Clear Glass;	PE=polyethyle	COC Time: ene; O=Other	(Specify)
Number	Code		me Pres	servative		analysis and/o		Comments	wel	1 dry			y Co Vianiaci			
± 0.1 for	pH;	± 3% for	r Specific C	onductiv	ity and T	emperatu	re; ± 10	mv for l	Redox Pot	tential;	± 10% fo	r Dissolv	ed Oxyge	en and Tu	rbidity	

. TRATECH

LOW FLOW GROUNDWATER SAMPLING LOG

					LC	/W FLC	יחט אינ	UUNU	VAIEN	SAIVIF	LIIVG LC	JG				son, NV Project
Task Name:	Doce	Treata	6174	Avdy	Task Manag	er: C- Ro	emer			Task No:	11/13			Well ID: (/)	FMW-0	<u> </u>
	D. Kee									Recorded b	7	du		Date: 0 /		
Well Depth (it BGS		_ 1	MP Dis	stance AGS (ft): —		Well Depth ((ft BMP):	39	Screened/0	pen Interval 1			(ft BGS)	34'	(ft BMP)
Well Diameter (in):	2		PID/FI	D Readings B	Beneath Inner	Cap (ppm c	ge akb):			Screened/0	Open Interval E	Bottom:		(ft BGS)	39	(ft BMP)
Pump and Tubing	Type: Q	ED RIA	der o	ind poly	tubille		Pump Intake	e Depth:		(ft BGS)	3¢.	5	(ft BMP)	MP Descripti		
Equipment Decon.					Liquida		Depth to Wa	ter Before F	ump Installatio	n (ft BMP):	79.38	Time:	186/10/21	GW Disposa	1: GW-11	fond
Time PURGING	SAMPLING REA	Temp.			H Jnits)	Spec Co	nductivity /cm)	DO,	ed Oxygen (mg/L)	A ST Charles and the	Potential P (mV)	THE RESIDENCE OF THE RE	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time E	NEA REA	D CH	ANGE*	READ	CHANGE*	READ	CHANGE'	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0714 X	22	(3)		7.12		298		0.00 0.5	7	208		3.3		200	129.97	
0719 X		.To		7.34		2.19	<u> </u>	0.00/0.3	_	169		0.0		200	29.97	
0724 X	22.			7.37		2.98		0.00 0.2		145		0.0	-	200	29.97	
0729 X	22.			7.38		2.98	 	0.00/0.2		130		0.0		700	29.97	
0734 X	- 22.			7.31				0.00 025		120		0,0		700	29.97	
			/	F	_/_	2.98	/	0.0002			-/	0.0	 ./	Zoc	29.97	
0745 X STABILIZATION																
1	_								\pm		 					
-\ -			/								-		13/			
		/-		\-						-			16	ļ		-
		_/		\			/		_	<u> </u>		-nk	9/1		ļ	
\		/_		[`	\						<u> </u>	0/				
	/_										\			ļ	ļ	
	/						ļ						_			
				_									<u> </u>			
Sample ID: UFff			विनिव	06	Duplicate IC): <u>-</u>			_	QA/QC Sa					COC Time:	0741
	Contain	er	4					1							ylene; O=Othe	r (Specity)
	erial ode	Volume	Dro	eservative	Intended	Analysis and	or Method	Commen	contamination:	Y N	Field Filtere	Q: Y IN	COC Numb	er:		
Mulliber Co	ode	Volunte	1	Servative	i ikeliueu .	Allalysis allu	or inclined		" dra	Muse	ter	٨				
l n a v		. ~ ~	_	1.	~ i-						fer : (ilear				
1-1-1P-11h-1	1 D	- >- <	Samp	2/1/1/	201			11		291	Н					
			1						11-	$f) \cup f$						
								Signatu		~ 1			<u></u>			
*INDICATOR PA												-				
± 0.1 for pH;			ecific	Conducti Conducti	_				r Redox Po	otential; min - Mir		Or Disso		en and T	OA - Quality	Angumen
	na filentind	SURFACE		T' - C'ontiges	do.	(4% × (400)	ind Sudace	mn// - m	midtam/i itor	mun - Mac	II II A	DAM - MAGGE	urana Point		VINGILL - ALL	ASSUITATICE

																_
Task Name:	AP PY	ba Troot	1967,745	trace .	Task Manag	er: G. K	Demer			Task No:	M13_			Well ID: V	FMW-01	$\nu_{}$
Field Sample	is: D			·				-		Recorded b	y. D.Ke	nd /		Date: /o	15/17	-
Well Depth (-1		tance AGS (t):		Well Depth (ft BMP); 4	9	Screened/C	pen Interval T	op:		(ft BGS)	' '44	(ft BMP)
Well Diamete	er (in):	Z	PID/FII	O Readings E	eneath Inner	Cap (ppm cg	ge akb): -			Screened/C	pen Interval B	ottom:		(ft BGS)	47	(ft BMP)
Pump and Tr	bing Ty	e: AFD	Bladder	Pumo W	polu til	o,he	Pump Intake	Depth:		(ft BGS)	46.1		(ft BMP)	MP Description	on: 10C	
Equipment D		——UL (r.—,	acket 1	mae W	12 voor	J	Depth to Wa	iter Before Pu	mp Installatio	n (ft BMP):	79.53	Time: 1/0	7/102/17	GW Disposal	: GW-1	
Electro Maria	(3		mp.	р		Spec Cor	nductivity	Dissolve	Oxygen	Redox	Potential		oidity	Purge	Depth to	Cum. Vol.
	2 3		'C)	(pH l		My fus				the state of the s	(mV)		TU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE'	READ	CHANGE*	READ	CHANGE*	Hon PO	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1419	χ	26.84				4.55		1,26/0.24		164		273		200	30.15	d
4				7.42		4.57		0.30 0-22		162	 	116		700	30.12	1000
1424	\Diamond	16.02	· · · · · · · · · · · · · · · · · · ·	7:43		!/!	l	0.10 0-19				207		200	l - I	
1429	<u> </u>	25.65		7.44		4.57		<u> </u>		159_		38-2 18.6			30.10	7000
1434	X_	25.52		7.44		4.57		0.01/0.19		158				700	30,10	3000
1439	X	25,42	/_	7.44	/_	4.58	/_	0.80 0.18	/_	156	- <i> -/</i>	6.4_	1110	200_	30.10	4006
1444																
1450 X STEBILIZATION (33																
1450 X STABILIZATION																
	1950 A STOCKET TOO															
			_/						\	X		1				16 - 17
	 		/	\	\					1		Cal .	 			
		<i></i> /	<u>/</u>		\		/			 \ 	^	1.11				
		/			-		<u> </u>	 		201	7)r		<u> </u>		
		/				/_				-	9	(°				
			<u> </u>											<u> </u>		
				<u> </u>	<u></u>											i Li dec
			-2017	1005	Duplicate ID):	·	1 (QA/QC Sar			-		COC Time:	1450
Sa		ontainer			F) 8								=Clear Glas		/lene; O=Other	(Specify)
Mumbas	Materi		no Pro	servative	Intended	Analysis and	or Method	Comments	ntamination:	Y N	Field Filtered	I T IN	ICOC MUND	er.		
Number	Code	VOILII	ile Fie	Servative	IIItelidad i	Allalysis allu	OL MOUTOG	Conlinents		- مامدا	1					
								11	grown	awater.	clea					
ADA	and the	#1	Sam	10/104	Sel			1	C	0101		•				
711	EN.	- \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	OULVI	FUZ	OUL				•	114	/ \					
				·				Signature	(s):	DY	<u> </u>	_				
*INDICATO	R PAR	AMETERS I	HAVE STAB	LIZED WHE	N 3 CONSE	CUTIVE R	EADINGS A							12		
			Specific							otential;	4 10% fe	or Dissol	ved Oxy	gen and To	urbidity	
	_	Ground Surfa		C - Centigra			and Surface	mg/L - milli		min - Mir	nute	MP - Measu	iring Point		QA - Quality A	Assurance

Task Name: Field Sample		Area T	reatablica	y Study	Task Manag	er: G-1	vener			Task No: Recorded b	MB V: D.K	eady		Well ID: Up	MW-02	2
Well Depth (1	t BGS)	-	MP Dis	stance AGS		-	Well Depth ((ft BMP): 7	29		pen Interval T		-	(ft BGS)	72	(ft BMP)
Well Diamete		2	PID/FII) Readings	Beneath Inner	Cap (ppm o	-				Open Interval B	ottom: —		(ft BGS)		
Pump and To		and the same of					Pump Intake			(ft BGS)	Non		(ft BMP)	MP Descripti		
Equipment D							Depth to Wa	ater Before Pu	ımp installatio		DKY	Time:	1001011	GW Disposal		
	PURGING	Z T	emp. (°C)		pH Units)	Total Control of the Control	nductivity /cm)	DO (d Oxygen mg/L)	ORF	Potential P (mV)	(N	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	2 5	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
WE	L	OBSER	VED TO	DE	DRY,	UNA	LE -	10 59	mg Le							
		/								. 12						
		X								14				1		
	X	-		-		\			- 6/	71			-			
	/	+					1		X				1			
									9							
/_								/					-			
-	H	-			-					-						
Sample ID:			3/12		Duplicate If):		1		QA/QC Sai					COC Time:	12
	Mate			4:		Analysis son	for Mathed	Field Deco	ntamination:		vial; AG =Ambe Field Filtered		COC Numb		/lene; O=Otne	г (Ѕреску)
Number	Co	de Volu	ume Pre	eservative	Interided	Analysis and	/or Metriod	Comments		elldry	<i>/</i> .					
										2	,					
				1995				Signature								
			HAVE STAB							otential	+ 10% fe	nr Dieso	lved Oxy	gen and T	urbidity	
		v Ground Sur		C - Centigr				mg/L - mill		min - Mir		MP - Measi			QA - Quality	Assurance

,e ____ of ____

NERT, Henderson, NV Project

Task Name:	API	Arpa Tre	atability	Study	Task Manag	er. G.Ro	રાંભાજ			Task No:	MI3				FMW-02	LI
Field Sample	rs: D	Kpady								Recorded by	y. D. Ke	ndy		Date: 10 /	6/17	
Well Depth (t BGS):		MP Dis	tance AGS (f	t):		Well Depth (ft BMP): 3	9	Screened/O	pen interval T	op: /		(ft BGS)	34	(ft BMP)
Well Diamete	er (in):	7	PID/FII	O Readings B	eneath Inner	Cap (ppm c	ge akb):		_,	Screened/O	pen Interval B	ottom:		(ft BGS)	31	(ft BMP)
Pump and To	Jbing T	/pe: Q.E.D	Bladder F	ump or	1d Dolut	Lina	Pump Intake	Depth: -		(ft BGS)	~30	. 5	(ft BMP)	MP Description	on: TOC	
			cket rMS		igunax		Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	30,21	Time:	10217	GW Disposal	GN-111	Pond
			emp.	р			nductivity	Dissolved	Ovvden	Redoy	Potential	100000	idity	Purge	Depth to	Cum. Vol.
	N N		*C)	(pH L		M (VIS		II \ DO.(r	ng/L)	The second second	(mV)		ru)	Rate	Water	Purged
Time	PURGING SAMPING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	Horn 90/1	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0920	X					3.94		0.84/030		172		711		700	30.90	Ø
797 C	5-	23,93		7.50							-				30.91	_/
0925	X X	73.88		3.51		4.01		0.07 0.24		178		178		700		(000
0930	X	23.87		7.52		4.03		000 0.5H		164		79.5		200	30.92	7200
0135	X	238		7.52		4.04	ļ	0.00/0.22		161_	***	36.8		200	30.94	3000
0940	X	2385		7.52		4.07		000 0.20		158_		5,6		200_	30.95	Mos
0945 1 23.86 7.52 4.08 0.00 0.19 156 0.0 (65) 700 3														30.95	5000	
DACO	250 X STABILIZATION 0.00(0.14) 156 0.0 765 700 58.4) 3200															
CASO X STABILIZATION																
											<u> </u>					
									_/		 \ 					
									/	<u> </u>				-1.117		
-	-		/			\					\		\	0/6/-		
\-	_		/					/					1	<u></u>		
	<u> </u>		/						 	<u></u>			_0_			
							/									
	1															
Sample ID:	ITT	NW-02	II-201	1006	Duplicate ID	: —				QA/QC San	nples/ID: -	_			COC Time:	0950
		Container	_111		2 2			Material Co	des: VOA = 4	40 ml glass v	ial; AG =Ambe	er Glass; CG	=Clear Glass	; PE=polyethy	lene; O=Other	(Specify)
	Mate	rial						Field Decor	ntamination:	Y N	Field Filtered	: Y N	COC Numbe	n.		
Number	Cod	e Volu	me Pre	servative	Intended /	Analysis and	or Method	Comments			١٠					-
									gro	unama	ter: C	100-				
-pp-6	Den	1-6	SAM	Pling	<u></u> Q1				/	COlo	r	(KOR				
1 17 1	100	1.0	90111		00						1					
				' V				[] Cinnat		11	V					I
HINDICATO	DDAT	AMETERS	HAVE STAB	17ED WUE	N 2 CONCE	CUTIVE D	EADINGE A	Signature	,		7		 			
			r Specific							otential:	+ 10% f	nr Diesok	ved Ovvo	en and Ti	urhidity	
			are Specific										ring Point		OA - Quality A	ecurance

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Lite mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

NERT, Henderson, NV Project

Task Name:	A	PF	frea T	reatabili-	71, Stell	Task Manag	er: G.Ro	emer			Task No:	M13			Well ID:	FMW-E	DZD
Field Sample		D.	Kano		/ /						Recorded b	y. D. Ke	ady		Date: 10	6/17	
Well Depth (ft BG	S):	-	MP Dis	tance AGS (f	t):		Well Depth (ft BMP):	19	Screened/C	pen Interval T	ор: /		(ft BGS)	' 44	(ft BMP)
Well Diamet	er (in)	7		PID/FIE	Readings E	eneath Inner	Cap (ppm c	ge akb): 🛭 —			Screened/C	pen Interval B	ottom:		(ft BGS)	49	(ft BMP)
Pump and T	ubing	Тур	e: QHD F	Blodder Pung	p and pe	ly tubing		Pump Intake	Depth:		(ft BGS)		16.5		MP Description		
Equipment [econ	. Me	thod: 3 \	bucket ri	nse WI	-THUNGE		Depth to Wa	ter Before Pur	np Installatio	n (ft BMP):	30-24 <u></u>	Time: ()	2/10/2/1	GW Disposal	Gw-	1 Pohl
essure in the				emp.	р			nductivity	Dissolved	l Oxygen	Redox	Potential	Turi	oidity	Purge	Depth to	Cum. Vol.
	Ž		(°C)	(pH L	Inits)	M (Lis	/cm)	Hank DO (n	ng/L)	ORF	(mV)	(N	TU)	Rate	Water	Purged
Time	PURGING	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0822	X		24.11		7,47		5.17		0.87/02		181		7.56		200	31.09	Ø
0827	X		24.40		7.49		5.17		0.14/0.2		174		75.4		200	31.01	1000
0832	X		2445		7.49		5.18		0.00 0.27		170		8.8		700_	30.98	2000
0837	V		24.50	,		/	5.18	/	0.00 0.25			 	00		200	30.92	3000
0842			24,56		7,50		5.18	/	0.00 0.23		166		0,0	V (Cr)	200	30.92	4000
0075	^	\rightarrow			1100		7.10		0.00 (0.17)		-14.6		-010		200	30,10	
<u> </u>	0845 X STARILIZATION																
_		_			/	\											Sn.
		_										<u> </u>					
						_\											
\				/								\	\	<u> </u>		Y	
													\		10/91		
				/							10			T			
					 							1		92			
								1									
Sample ID:	 	17	314150	ZD-20=	FIADG	Duplicate IE):	-	1		QA/QC Sar	nples/ID:	-		ļ i	COC Time:	0845
			ntainer	1	1 (000	la la la la la la la la la la la la la l			Material Co	des: VOA =		•	er Glass: CG	=Clear Glass	: PE=polvethy	lene; O=Other	VV
		teria	-									Field Filtered		COC Number			
Number		ode	Volu	me Pre	servative	Intended	Analysis and	or Method	Comments:								
	П									dr	ound	rater:	clo				
70.0				C C						0.	(a)	or 1	CIRI	W			
HYP		H	24 -	J Jan	19 mg	- 26-			<u> </u>	~		1					
1 /0	*				1_0					\	77	1/					
						110001:0	-0.170.2	EADINGS 1	Signature		1/ \	1/					
				HAVE STAB							ntantial:	100/4	or Dissel	uad Ovus	en and Tu	rhidity	
				r Specific (C - Centigra			ure; ± i und Surface	mg/L - millig		otentiai; min - Mir		MP - Measu	_	en anu 11	QA - Quality A	/centrance
500	- Del	uw c	Fround Surf	aut	o - cernigia	n <u>o</u>	00 - UIU		— mg/⊑ * ndiiij	ALGITO PICE	11001 - 14111	IUIG	IAII - IAICOPE	naig i Ollit		ALL - Amount & L	1000101100

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

TETRATECH AP Area

LOW FLOW GROUNDWATER SAMPLING LOG

Task Name		Hu C		reatability Stud	у	Task Manag	jer: And Ayy	iaswami C	. Roeme		Task No: -M	12 MI3			Well ID: -CTI	W-00D UF	mw-035
Field Sampl	ers: e	Jeff R	icheson.	Dikear	١,						Recorded by	r: Jeff Richeco	# DK	endy	Date: (o	16/17	
Well Depth			-	MP Di	stance AGS	(ft): ——		Well Depth (ft BMP):-54	25 76	Screened/O	pen Interval To	p; -	_ ((ft BGS)	71	> (ft BMP
Well Diamel	er (in): 2	3777	PID/FI	D Readings I	Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval Bo	ottom:		(ft BGS)	26 7	紙 (ft BMP
Pump and T	ubing	Тур	e: GED 9 8	imple Pro (blad	der) with poly	tubing		Pump Intake	Depth: -		(ft BGS)		-44-	(ft BMP)	MP Description	on: TOC	
Equipment (Decor	ı. Mel	hod: -3-Du	cket Rinse with	Liquinox			Depth to Wa	iter Before Pu	ımp İnstallatio	n (ft BMP):	DRY	Time: 1	14 (kokla	GW Disposal	GW-11 Pon	+
	SING	SAMPLING		emp. (*C)		pH Units)		onductivity S/cm)		d Oxygen (mg/L)	The state of the s	Potential (mV)	Tur	bidity ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PUR	SAM	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
WEI	L	C	SER	VED	to \$	E D	RY;	UNA	RLE 7	SAL.	MLE.						
												100					
	1						_/			1						,	
	+			-			-/-	-	500	1				-			
	+						/			1							
	T	1				/									13		
															6/		
	1		_			/				-				, 10	,		
	+-	-	-/			/		+		-	-			DE			
	-													/			
Sample ID:						Duplicate II	D:				QA/QC Sam	nles/ID·				COC Time:	
	ampi	le Co	ntainer						Material C	odes: VOA =		al; AG =Ambe	r Glass; CG	=Clear Glass	; PE=polyethy		(Specify)
	IAIG	altila Inda								ontamination:		Field Filtered:		COC Number			
Number		Code	Volu	ume Pro	eservative	Intended	Analysis and	1/or Method	Comments							-	
	+								Ferrous In								
		n-Sil	u Chron	ilum Treatab	ility Study	Sampling B	ottle Set		Greundwa	ter Color is	707	1			214		
	-					1			Signature	e(s):							
				HAVE STABL					E WITHIN:		U	-					
± 0.1 for	· pH	; :	± 3% fo	r Specific (Conductiv	vity and T	emperat	ure; ± 10	mv for F	ledox Pot	ential; :	± 10% for l	Dissolve	ed Oxyger	and Turb	idity	

NERT, Henderson, NV Project

	4/		/ -		`			The said to								
Task Name			715		Task Manag	ger: Arc		63 Wa	MI	Task No:	MIZ	- /		Well ID:	IFMW.	-03I
Field Samp			Cheson	٦			- 77			Recorded b	y JEH	Rich	P500	Date: 10	11./1-	7
Well Depth				istance AGS			Well Depth	(ft BMP): 🐧	10	Screened/C	pen Interval	Тор:		(ft BGS)	30	(ft BMP)
Well Diame	ter (in):	۵″_	PID/F	ID Readings	Beneath Inne	r Cap (ppm c	ge akb):	_		Screened/C	pen Interval i	Bottom:	_	(ft BGS)	40	(ft BMP
Pump and 1	Tubing T	ype: QE) Bloco	18/ W	/ poly	tubing	Pump Intak	e Depth: -		(ft BGS)	35		(ft BMP)	MP Descripti		
Equipment	Decon. N	Method:	Rucke	of re	254	/	Depth to Wa	ater Before Pr	ump Installatio	n (ft BMP):	28,70	Time:	0825	GW Disposa		Pona
1/1	ပ္ ပ္	Т	emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turi	oidity	Purge	Depth to	Cum. Vol.
	S S		(°C)	(pH	Units)		/cm)	Ho 794	The Late of the La		(mV)	CONTRACTOR OF THE PARTY OF THE	TU)	Rate	Water	Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	150 150 150 150	(ft BMP)	(ml)
083		21.70		7.29		3.89		2.79/4	6.2	101		23/	12 11	200	25,70	0
083		21,18	1	7,22		3,89		A	24	101		53,4		200	28,8/	11
084		20.99		7.22		3.89		//	56	100		9,2		200	28,74) /
0845		20,98		7,22		3,84			.89	100		0,0			28,72	37
0850		20,97	7	7.21	/	7	/	1.60/3	10/	100	 					111
2859	I - I -	20.92		175			-/		05		-/	0,0		200	28,74	44
2000	-	20110		7.21		3,90		1.59/3	06	100		0.0		200	28,73	54
		ļ.,	ļ/	 			/_	<u> </u>	<u> </u>					\		
		ļ <u>.</u> .		\								1				,
	- -			_						!	1. 1918	1				
				\												
			1								(y					
				\					\\		/					
		/														
	 	—							\							
Sample ID:	HEM	1./_ 02	T-2017	100/	Duplicate ID		VA		<u> </u>	04/00 0	#D.	/	. 71			- 00 -
Sa	mple C	ontainer	1-00-11	NAN D	Daplicate ID			Material Co		QA/QC Sam	•			DElth	COC Time:	0855
	Materi							Field Decor	ntamination:	V) N	Field Filtered	V N	=Clear Glass; COC Numbe		lene; O=Other	(Specify)
Number	Code	Volu	me Pre	servative	Intended A	Analysis and/o	r Method	Comments:		<u>''' '</u>	I leta I literea	<u> </u>	COC Nullipe	1.		
									600	cale	2	10	1/01	7		
					0/11				600	CVI		/ /	(/("			
	AF	' A	ca T	.5.	Rottl	0 (4	1					•			f
	· · · l						/		,	1 _	7 K	2	2			- 1
-11.1001								Signature(s):							
TINDICATO	H PARA	METERS	HAVE STABL	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF	RE WITHIN:						1,5		
± U. I TO!	Poleur (± 3% 101	Specific (onductiv	<u>/ity and T</u>	emperati	ire; ± 10	<u>) mv for l</u>	Redox Po	tentiál;	± 10% fo	r Dissolv	ed Oxyge	en and Tu	rbidity	
DL1.3	- DEIOW I	SOUR DOUGLE	ire	 Lantinrad 	0	GC Centre	of Custons			5 B 61 A						

BGS - Below Ground Surface BMP - Below Measuring Point

COC - Chain of Custody

GS - Ground Surfa ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

NERT, Henderson, NV Project

Task Name	: A?	ACPA	T. 5		Task Manag	ier:	1 / 197	10560		Task No	113			Wall ID: //		7.0
Field Samp			Riches	20			אראביוא	Gr Rosi	nur	Recorded b		C 0 -	heson	Date: 10	FMW-0	3 <u>//</u>
Well Depth	V-			istance AGS	(ft):		Well Depth		50		pen Interval 1		-	(ft BGS)	45	(ft BMP)
Well Diame	ter (in):	<u> </u>	PID/F	ID Readings	Beneath Inne	r Cap (ppm o					pen Interval E			(ft BGS)	50	(ft BMP)
Pump and	Fubing Typ	e: QEI		18- U			Pump Intak	e Depth:		(ft BGS)	47.		(ft BMP)	MP Descripti		
Equipment					nse	1000			ump Installatio	· · · · · ·	28,77		710	GW Disposa		
	l (g)		7700											CITY DISPOSE	1: 6W-	11 Pono
	PURGING SAMPLING		emp. °C)		oH Units)	4 Delivery Allery County	nductivity i/cm)	Total Control of the	ed Oxygen	The state of the same of the s	Potential		oidity	Purge	Depth to	Cum. Vol.
T:	AMP AMP	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	the May	Thange	17.70	(mV)		TU)	Rate (ml/min)	(ft BMP)	Purged
Time	150 1		DIMITOL		CHANGE		CHANGE		 	READ	CHANGE*	READ	CHANGE*	8 //		(ml)
0725	1 1	20.69		7,32		4,39	ļ	4.23/	\$46	79		3918		200	28,77	0
0730		20.10		7,39		4,37		4,24/	\$31	83	18	41.3		200	29,01	16
9735	X	20,13		7.38		4,37		3.79/9	145	85		47.4		200	29,03	2(
P740	X :	20,19		7.39		4,37		3.59	.48	86		44,7		200	29,02	34
0745	1 - 1	20.28		7,40		4,37	,	17	159	87				200	39,03	
	-15-31-71-		J	- UI			<i></i>	2 100	12/			40,5				75
V1.JU	0750X 20,39 7,41 4,37 3,19153 88 37,7 1 200 29,015C															
	100 27,0136															
	 -			\			/						. .			
	 		-/	\				\ <u></u>	\							
			/	_		/_			\		, IP					
_		X	, 								10					
		/				/				~ b	7		_/			
		7				·										
		_/-		\··										-/		
								14							<u> </u>	
Sample ID:	8 15 200	/ 201	N - N - (**)	100/	Described 15		1 // 1	<u></u>				11/1	X.			
	imple Cor)-2017	1906	Duplicate ID	/	VIA	iii Lii		QA/QC Sam		<u>V//</u>			COC Time:	0750
J.	Material	laner I					W _a reg	Material Co	odes: VOA = 4	0 ml glass via	al; AG =Ambe	Glass; CG			lene; O=Other	(Specify)
Number	Code	Volum	e Pre	servative	Intended A	nalysis and/	or Method	Comments	ntamination: (Y)N	Field Filtered:	(Y/N	COC Number	<u>r:</u>	_	
		1	110	0017041170	miteriaea n	ilaysis allur	or Metriog	Comments								1
										cal	0- 15	-/	, , , , , , , , , , , , , , , , , , , ,			- 1
	120	ALG	70 -1	5	Rotal	10 5	2		660	COR	17	(/ 1	647			i
					-04-1-1-	16	,-[_			-				l.
								Signature	(s):	7	R	R				I
*INDICATO	R PARAN	IETERS H	AVE STABL	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AF	RE WITHIN:		/				114.		
± 0.1 for	рH; ±	3% for	Specific C	Conductiv	ity and T	emperati	ure; ± 10	0 mv for l	Redox Po	tential;	± 10% fo	r Dissolv	ed Oxva	en and Tu	rbidity	
BGS -	Below Gro	ound Surfac	e (C - Centigrad	8	GS - Grou	nd Surface	ma/L - millio	ram/Liter	min - Minut	a 1		no Point		OA - Ouglity As	

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

DT. Handaman All/ Brainst

									7777-11		tu L	<i>-</i>		INE	:mi, nenders	son, ivv Project
Task Name	R. E	ma Th	entala).7	1 Stray	Task Manag	er: (K	ormer			Task No:	MI	?		Well ID: [/	FMW-0	45
rield Sample	rs: 1	2 Kead	<u>ly</u>	\						Recorded by	V DIK	ead	,	Date:	0/5/1	7
Well Depth (f):	- MP Di	stance AGS (Well Depth (ft BMP):	79	Screened/O	pen Interval T			(ft BGS)	7291	(ft BMP)
Well Diamete		2			Beneath Inner	Cap (ppm c	ge akb):			Screened/O	pen Interval E	Bottom:		(ft BGS)	29	(ft BMP)
Pump and Tu	bing	ype: DED	Bladder Ph	rand p	plytulin	الم	Pump Intake	Depth:		(ft BGS)	76.	5	(ft BMP)	MP Description	on: TOC	
Equipment D	econ.	Method: 3	right uni	e will	7, whox	0	Depth to Wa	ter Before P	ump Installatio	n (ft BMP): <	2837	Time:	14dal) 670	W Disposal:		Pond
			emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Bedox I	Potential		bidity		12 x 10 / x 10 -	P
	SIN		(°C)		Units)	Muss		He PO	mg/L)		(mV)		ITU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE	(ml/min)	(ft BMP)	(ml)
0939	X	25.71		7.30		4.44		094		162		0,0	R	100	NW	d
0944	Χ	26.41		7.17		4.26		0,42		157		0.0		100	NM	500
0949	χ	26.99		7.27		4.19		0.12		154		0.0	1	100	NM	1000
0154	X	26.67		7.30		4.24		0,21				0.0		100	NM	100
0959	X	26.52		7.30	/	4.25		0.19	/	_158_ _161		0.0		<u>'</u>		
1000 X STAPILIZATION 9.18 0.19 161 0.0 100 NM 2000															2000	
1	1000 X 5) PIGILI 7/110 N															
-		 		<i></i>		/					_/_					_/
										10						() X ()
		- 								_//						
			/				\l			121						
									- 3	194						
									A 00							7
									8			-				<u></u>
		\						de								
Sample ID: \	FM	M-042	-201710	or	Duplicate ID:		· · · · · · · · · · · · · · · · · · ·	F	(QA/QC Sam	ples/ID:	_			COC Time:	000
San	nple (Container						Material Co	odes: VOA = 40	mi glass via	I; AG =Ambe	r Glass; CG	=Clear Glass;	PE=polyethyle		
I	Mate	-			17.5		A PORT	Field Deco	ntamination:		Field Filtered:		COC Number			
Number	Cod	e Volu	me Pres	servative	Intended A	naiysis and/o	r Method	Comments	Charles	رما .		 '		_		
							785		yroun	awatt-	: cle	sign.				
DO AL) (I	7-7-17	aunsti	(A)	سله	 			V (0)	1		*()				
-11 14	7/	10	3000711	7-9	7.7					11						
			37-7-	V	· · · · · · · · · · · · · · · · · · ·			Signature	ich L							
INDICATOR	PAR	AMETERS	HAVE STABL	IZED WHE	N 3 CONSE	CUTIVE RE	ADINGS AR	E WITHIN:	()	$\rightarrow \theta$						
			Specific C							ential:	+ 10% fo	r Dissol	ved Oxyge	en and Tu	rhidity	1
200 (ata	Converd Confe		2 0 11 1							- 10/010	. 213301	- CA OXYU	ar arru Tul	DIUILY	

BGS - Below Ground Surface BMP - Below Measuring Point C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts

min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

≱TRATECH

LOW FLOW GROUNDWATER SAMPLING LOG NERT, Henderson, NV Project Task Manager: G.Rocher Task Name: Hra Treatability Study Task No: Well ID: UFMW-04T Field Samplers: Recorded by: D. Keak Date: 0/5/ Well Depth (ft BGS): MP Distance AGS (ft): Well Depth (it BMP): Screened/Open Interval Top: (ft BGS) (ft BMP Well Diameter (in): PID/FID Readings Beneath Inner Cap (ppm cge akb): Screened/Open Interval Bottom: (ft BGS) (ft BMP Pump and Tubing Type: QED Blader pump and poly Libra Pump Intake Depth: (ft BGS) (ft BMP) MP Description: Equipment Decon. Method: 3 buttot case w/ Liquidox Depth to Water Before Pump Installation (ft BMP): OTY IC2 TOW Disposal: Time: GWI-11 Pon. PURGING SAMPLING Temp. **Spec Conductivity** pН **Dissolved Oxygen Redox Potential** Turbidity Purae Depth to Cum. Vol. 100 (mg/L) (°C) (pH Units) m (dS/cm) ORP (mV) (NTU) Water Rate Purged READ READ CHANGE* READ CHANGE* READ CHANGE* Time CHANGE' (ml/min) (ft BMP) (ml) READ CHANGE* READ CHANGE* 0825 2463 3.96 7.29 35,4 1.02/0.24 171 0 28,60 200 **Q**\$30 25.91 7.29 0.23/0.16 3,99 164 0.0 28,6c 200 8 60 0835 74.22 4.01 0.00/0.12 158 0.0 700 28.60 7.000 26.27 0.00/0.11 4.02 156 0.0 700 Foc-28.60 26.37 7.3 0,00/0,6 4.02 153 0.0 700 28.60 4000 STABILITATION Sample ID: UFMUI - 04I -2017-005 Duplicate ID: QA/QC Samples/ID: COC Time: 0850 Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Filtered: Y N Field Decontamination: Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method Comments: nowher: Char Sampling

'INDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:

± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody

GS - Ground Surface ID - Identification

mg/L - milligram/Liter mV - milli Volts

Signature(s)

min - Minute ml - milliliter

MP - Measuring Point NTU - Nephelometric Units

e <u>l</u> of <u>l</u>

Task Name:	Task Name: AP Area Treatability Stuly Task Manager: G. Roemer Task No: M13 Well ID: UFMW-04D															
Recorded by: D. Keady										adu			15/17			
Well Depth (ft I	3GS):	!	MP Di	stance AGS	(ft):		Well Depth	(ft BMP): 4	9	Screened/C	pen Interval			(ft BGS)	1-1-40	/ (ft BMP)
Well Diameter	(in):	_2_	PID/FI	D Readings	Beneath Inne	r Cap (ppm c	ge akb):			Screened/C	Open interval E	Bottom:		(ft BGS)	49	
Pump and Tub	ing Typ	DE: QED	Blacker pu	imp and	poly tuby	-	Pump Intake	e Depth:		(ft BGS)	46.5		(ft BMP)	MP Description	ion: 100	
Equipment Dec	on. Me	ethod: 3	include the	se W/Li	rinox		Depth to Water Before Pump Installation			n (ft BMP):	28-17		5 hotin	GW Disposal		- 1 - 4
	_		emp.		Н	Spec Co	nductivity	Dissolve	d Oxygen	Bedox	Potential		oldity	Business No. No. 2015		11 11 11 11 11 11
			(°C)	,	Units)	MUS		Heat DO	mg/L)		(mV)		TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
Time	SAMPLING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0719 >		22.49		6.77		4.19		0.560.23		231		730		200	28.83	1
0724 X		23.76		7.32		4.95		0.01/020		201		98.0		200	28.84	1000
0729 Y		24.02		7.38		4.92		0.00/0.18		189		18.2		200	28.84	2000
	0734 X 24.26 , 7.40 , 4.92 , 0.00 017 , 180 , 0.00 , 200 78.84 3000															
	6222 V 2442 / 2442 / 2462															
	0759 X 57AB WZATION 4.91 V 9.91 V 0.00/0.17 V 173 V 0.0 V (3) 700 78.84 4000															
	O TO STABILITY THE STATE OF THE															
						/						-/-				····
						_					31			$\overline{}$		
	-			/			\		<u> </u>	18	S				\	
/																
																
	+-}		/						_/		ļ					
Cample ID: 416	-441	1 0 (1)				. = . 41	1 21 :									
Sample ID: () F	ample ID: UFMW - 04D -2017 1005 Duplicate ID: 11FMW-04D-2017 (005-FD QA/QC Samples/ID: — COC Time: 0747															
	Sample Container Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify) Material Codes: VOA = 40 ml glass vial; AG =Amber Glass; CG =Clear Glass; PE=polyethylene; O=Other (Specify)															
1	Tribid Decontamination. 1 14 Tribid Pilleted. 1 14 [COC Multiplet:															
$\Delta 0 \Delta$	AP Area T.J. Sampling Set ground water color-clear															
HI Me	H treatis sampling set															
Mari		-	1 1					1	1	た八						ĺ
NAIDICATOR	24524	METERS:	IAME OTAS:	1355 145:3				Signature(s):		4					
*INDICATOR F										(1			120		E-0
90. POI PI	0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															

NERT, Henderson, NV Projec

								0		O'Allin' I	-11101 2.0	- Table 200		INE	in I, nelidels	son, nv Project
Task Name	: AP	Alea	T.5.		Task Manag	er:	4000	Roem	er .	Task No:	M/3	- 53		Well ID: //	FMW 05	- (
Field Samp	lers:	TH	Riche.	Son			-71/-			Recorded b		cheso	2 -7	Date: 10	15/17	2
Well Depth			The second second second second	stance AGS	(ft):		Well Depth (ft BMP)	07		pen Interval 7			(ft BGS)	-	(ft BMP)
Well Diame		2//		The second secon	Beneath Inner	Can (nom c	And the second s		, -		pen Interval E	- -		(ft BGS)	35	
Pump and		pe: QE		der			Pump Intake	Donth: -				OUIOIII.	/4 DMD		50	(ft BMP)
Equipment		-				Judin				(ft BGS)	27.)	(ft BMP)	MP Description		1 2 /
			bucken	710	27		Debtu to Ma	iler Belore Pi	ump Installatio	n (IT BMP):	29.10	Time: /	1915	GW Disposal	1: 6W-11	fond
	9 2	To	emp.		H	Spec Co	nductivity	Dissolve	d Oxygen	Redox	Potential	Turk	oidity	Purge	Depth to	Cum. Vol.
	혈重	1	(°C)	(pH	Units)	(uS	/cm)	JL P90		ORP	(mV)	(N	TU)	Rate	Water	Purged
Time_	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
0930		22.15		6,21		9.84		4.70/2.0	11	174		83.1		200	29,10	d
0935		23.65		5.84		9 03	- 1	11		-						11
-		74,27		1		7137		3,50/21		192		74.0			29,25	14
0940				5.66	-	9.30		3.35/1.	87	199		71,/		200	29,31	26
0945		24.45		5,61		9,27		3.19/1.5	13	202		73.7		200	29,33	36
095	X	24,78		5.55		9.14		3,04/1	70 /	204	/	71.8		200	29,30	41
095	XXX	25,09	V	5.58	1	9,02		2,98/1	12 1	206	-/	68.4	1	200	29.32	
1						1100		arraf i	-	0100		0017		200	~//) est	2
			1							1						
	-				1			/		-						
	-		-/		1			/					113			
			/	1000		9					1		1-11			
												. 10	N			
		/		-			/				1		n		1	
		/					1				1	71				
		/					/					y				
	1	/				-/										
Sample ID:	UFM	W-055	201710	05	Duplicate ID:		N	4	36	QA/QC Sam	ples/ID: .	NA		4011	COC Time:	0955
Sa	imple Co					- 4		Material Co	des: VOA = 4	0 ml glass via	al; AG =Ambe	Glass; CG	=Clear Glass;	PE=polyethyl	ene; O=Other	(Specify)
	Materia							Field Decor	ntamination:/	YN	Field Filtered:		COC Numbe		91	
Number	Code	Volum	ne Pre	servative	Intended A	nalysis and/o	or Method	Comments								
										,	-			· 1	,	\
	-				2111			6	W Col	01	15	(120	/	5.1+41	murky	/)
	AP	AL	ca T	.5,	Battle	547	-		-+1	1			C	7 / /	/	
						- ()		ł	17	1/2-						
		1				- 0		Signature(1	2.50					
INDICATO	DICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															
± 0.1 for	pH;	± 3% for	Specific C	onductiv	ity and To	emperatu	re; ± 10	mv for i	Redox Po	tential;	± 10% fo	r Dissolv	ed Oxyge	en and Tu	rbidity	
BGS -	Below G	round Surfa	ce (C - Centiorad	e	GS - Groun	d Surface	ma/L - millio	ram/Liter	min Minut		ID Manauri			24 0 . 5. 4	

BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surfa ID - Identification mg/L - milligram/L mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

______ of _____

NERT, Henderson, NV Project

Task Name: PP AreaTreatability Study Task Manager: G. Roemer Task No: MI3 Well ID: UFMW-05I																
Field Sampl	ers: D.	Keady								Recorded b		1011		Date: 10	14/17	
Well Depth (stance AGS		-	Well Depth	(ft BMP):	40	Screened/C	pen Interval T	ор:/ _		(ft BGS)	75	(ft BMP)
Well Diamet	er (in):	2	PID/FI	D Readings	Beneath Inner	Cap (ppm c				Screened/C)pen Interval E	Bottom: _		(ft BGS)	40	(ft BMP)
Pump and T	ubing Ty	pe: CLED [Bladder pu	1P And	poly tubi	<u>\</u>	Pump Intake			(ft BGS)		7.5	(ft BMP)	MP Descripti		
Equipment 0	econ. M	ethod: 3 b	rucket hi	1sc W	Lighthak	-	Depth to Wa	ater Before	Pump Installa	ion (ft BMP):	78.90	Time: (57 102 P	GW Disposa	1: GAN -11	Pond
	PURGING SAMPLING	To	emp.		Н		nductivity		ved Oxyger		Potential		bidity	Purge	Depth to	Cum. Vol.
	N P		(°C)		Units)	M (ds		Harby V	(mg/L) CHANGE		(mV)	(N	TU)	Rate	Water	Purged
Time			CHANGE*	READ	CHANGE*	READ	CHANGE*			READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1349	X	27.77		7,09		5.29		0.94/0.	82	17.5		228		200	29.12	6
1354	X_	27.68		7.10		5,33		0.60/0	.62	117		73.5		200	29.13	(000
1359	X	27.63		7.12		5.34		0.59/0.	58	112		36.3		200	29.13	7000
1404	X	27.63		7,12	<u> </u>	5.35		0.59/0.	57	110		24.2		200	29.13	3000
1409	X	27.59	/	7.12	,	5,36	,	0.49/0		109		11.7		200	Z9.13	4000
1414_	X	27,50		7113	J	5.39	V	0.48/0	51 1	109		3.8	1(4)	700	24.13	5000
1420	×		LIZATIO						<u></u>						1	
1								0.3								
												/				
			/_						_	 	i	/-				
			/		 			<u> </u>	/							
			/		\				//	 						_/
-		/	/		······				/				\			
						\		/					<u> </u>			
						-		/		ļ					25	
Sample ID:	I DO IAA S	1-15-7	-2017100	l.f	Double on ID										2/	授
Sample ID:	mole Co	ntainer	601 7 100	7	Duplicate ID:	_		Matarial	Onder VOA		ples/ID: -	01 00				1450
08	Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered: Y N COC Number:															
Number	Jumber Code Volume Preservative Intended Analysis and/or Method Companies															
	AP Area T.S. Sampling Set Color: Clear															
- IXD	2000	77	C	17.						color	· : (lear				
	110	1.0.	James	JUNE	_ Het					~ l	1					- 1
100		-		0						1301	\ _					ł
INDICATO		METERS	LAVE STAD	17ED WITE	UA COMOC	NATIVE CE	ADIMOS	Signatu	re(s):	Y						
+ 0.1 for	NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:															
	0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															

BGS - Below Ground Surface BMP - Below Measuring Point

C - Centigrade COC - Chain of Custody GS - Ground Surface ID - Identification mg/L - milligram/Liter mV - milli Volts min - Minute ml - milliliter MP - Measuring Point NTU - Nephelometric Units

	LOW I LOW GROOTEDWATER SAME LITTER AND A CO. THE AND A CO. THE AND A CO. THE AND A CO. THE AND A CO.															
Task Name:																
Field Sampl	ers: \). Kend	4			(J)				Recorded by	DK	-14		Date:	014/17	<u>-</u>
Well Depth				stance AGS (ft): —		Well Depth (ft BMP):	50	Screened/O	pen Interval T	'ар: / -		(ft BGS)	145	(ft BMP)
Well Diamet	er (in):	2	PID/FI	D Readings B	Beneath Inner	Cap (ppm co	ge akb): -			Screened/O	pen Interval B	lottom:		(ft BGS)	<u>50</u>	(ft BMP)
Pump and T	ubing T	ype: QED B	Indder pur	no and	paky tub	nz	Pump Intake	Depth:	_	(ft BGS)	4	7.5	(ft BMP)	MP Description		
Equipment I	Decon. N	Nethod: 3	ncket ri	Hew	Utg, Line;	cO	Depth to Wa	ter Before Pu	mp Installatio	n (ft BMP):	28.70	Time: 1	058/10/41	W Disposal	: GW-111	Rond
			mp.		Н	Spec Cor	nductivity	Dissolve	d Oxygen	Redox I	otential	Turk	oidity	Purge	Depth to	Cum. Vol.
	NIS IN	('C)		Jnits)	m Kus		Horston DO			(mV)		TU)	Rate	Water	Purged
Time	PURGING SAMPI ING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1234	X	28.52		7.16		5.86		100 0.64		114		287		200	28,93	0
1239	X	27.75		7.14		5.89		081 0.47		112		148		200	78.95	1000
_	1244 X 27.55 7.15 5.91 0.99 0.38 111 80.5 200 28.96 2000															
	1249 X 27,44 7,15 5,93 0.9p/0.23 111 54.9 Zeo 28,96 7000															
1254	X			7.15		5.09		0.86/0.24	1	112		34.7		700	28.96	4000
12.59																
1304	X	27.39		7.15		5,89		0.85/0.2		114		15.8		200	28.96	6000
1309		27,40		7.15		5,90		0.84 0.2		114	,	8.7	_	700	28.96	7000
1314	 	27.38		7.14	J	5.90	-	0.81/0.30		115	/	4.3	(15)	700	28.46	8000
	 	<i>a</i> 1	u mem			2.10		2011-10		-17.2		1-3				
1320		2100	1713411	N		-					1.4					
									 	ļ. <u></u>	10/4/13					
				<u></u>		/				- A	194					
																
		<u> </u>	/													
01-15	(127	T LATEN	-7-17 (00)	 	Duntingto IF					QA/QC San	mloc/ID: "	_			COC Time: (1720
Sample ID:			-2017100	Į	Duplicate ID	: -		Material C	odas: VOA –		•	er Glass: CG	=Clear Glass	: PF=nolvethy		
	Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Material Field Decontamination: Y N Field Filtered: Y N COC Number:															
Number	Number Code Volume Preservative Intended Analysis and/or Method Comments: Code in the Code															
	Color: Clear															
	APArea T.S. Sampling Set															
/"/																
	1															
*INDICATO		PAMETEDS	HAVE STAR	LIZED WHE	N 3 CONSE	CUTIVE P	FADINGS A	Signature			- X		 	iii		
	NDICATOR PARAMETERS HAVE STABLIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: 10.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															
		Ground Surf		C - Centigra			and Surface			min - Min		MP - Measu			QA - Quality A	Assurance

NERT. Henderson, NV Project

Task Name:	AF	Ale	a TS		Task Manag	er 217	1 4.1	456	Pachas	Task No:	12	G 200 20		Well ID:		-15
Field Sample	-/-		Riches	00	Tradit Harlay	470	777	o) was	2-	Recorded b	MI3				FMW-	
Well Depth (JCH 1		stance AGS (ft)·		Well Depth	(H RMD). 7	o		y: -) (ipen Interval 1	Little be	h		0/5/1	
Well Diamete		211		ID Readings 6		Can Innm co		(II DIVIE).		The second of th	pen Interval E	The second second	_	(ft BGS) (ft BGS)	35	(ft BMP) (ft BMP)
Pump and To		roe: OF	D blade			NAME AND ADDRESS OF TAXABLE PARTY.		Denth:		(ft BGS)		2.5	(ft BMP)	MP Descripti		
Equipment D			bucker			TUDIN			ump Installatio		28.38			+	The second liverage and the se	
		7					_				- 1			GW Disposa	6W-11	pond
1	2 3	I	emp. (°C)		H Jnits)	Court of William Street Street, Street	nductivity /cm)	STREET, STREET	d Oxygen	Company of the Compan	Potential	The late of the second section in	oidity	Purge	Depth to	Cum. Vol.
Time	PURGING	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*		THANGE	READ	(mV)	READ	TU)	Rate (ml/min)	(ft BMP)	Purged (ml)
	X	-			OHANGE		CHANGE				CHANGE*		CHANGE		20.10.50	
0725	^	22.53		15,0		6.53		4,1/2		143		465		200	28,45	2
0730	X	23.13		6.13		6.44		1,75/24		157		187		200	28,56	14
0735	X	23.50		6.07		6,39		1.51/,3		158		98,0		200	28,58	26
0740	X	23.81		6.02		6.36		1.34/3	18	160		54, 1		200	28,56	36
0745		23,99		5.98		6.36		133/2	1/	161		56.3		200	28,58	41
0750	X	23.99	/	5,94	/	6.34	,	128/2		163			1	200	28.58	
0755	XX	23.97	V	5,93		6.34		1.24/1		164		58.2	1	200	28,5	
1							-	1.001111	4			ران		000	0,0,	0
								/			1					
1			-					-/-			-	- 7	1	19	-	_
			/					/			-		10	<i>Y</i>		1
	1		/	1000000			-/				-	1	10/21			
	1						/					\Q	/			
	-															
							4							115	450	
			-20171	005	Duplicate ID:	NI	τ_{-}			QA/QC Sam	ples/ID: UF	MW-C	165-201	171005	COC Time:	0755
Sar		ontainer		•				Material Co	des: VOA = 4	0 ml glass via	al; AG =Ambe	r Glass; CG	=Clear Glass;	PE=polyethyl	ene; O=Other (Specify)
Number	Sample Container Material Codes: VOA = 40 ml glass vial; AG = Amber Glass; CG = Clear Glass; PE=polyethylene; O=Other (Specify) Field Decontamination: Y N Field Filtered; Y N COC Number: Number Code Volume Preservative Intended Analysis and/or Method															
Ttombo	GOTHI DIRECT															
	an Area to pulle cot GW color is Clear (silty)															
	40	Alea	15	Rot	HP .	50+		6	W C!	0107	17 (Trap	6311	17 J		- 1
1	Ap Area 7.5. Boffle set 6W COLON 15 CITAN (SIJEY)															
	Signature(s): A R															
			HAVE STABL								Y.A.—	I- HOW	210,300			
± 0.1 for	0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mv for Redox Potential; ± 10% for Dissolved Oxygen and Turbidity															
BGS -	Below G	iround Surfa	ice (C - Centigrad	8				ram/Liter				na Point		Ω - Ouality Ac	Suranco

BMP - Below Measuring Point

COC - Chain of Custody

ID - Identification

mV - milli Volts

ml - milliliter

NTU - Nephelometric Units

QC - Quality Control

TETRATECH

	40 /	req			L	JW FLC	JW GH	<i>יעאטט</i>	VAIER	SAMPL	ING LU	/G		NE	ERT, Henders	son, NV Project
Task Name:			atability Study		Task Manag	er: Arul Ayya s	wami G.	Roemer		Task No: W	12 MI3			Well ID: GTW	IN SUF	mw-all
Field Sample	rs: Jeff F	licheson								Recorded by	y: Jeff Richeso	on		Date: /O	14/17	
Well Depth (f	t BGS):		MP Dis	stance AGS (f	t):		Well Depth (ft BMP): 🏍	40	Screened/O	pen Interval T	op:	_	(ft BGS)	35 2	(ft BMP)
Well Diamete	er (in):	Z	PID/FI	D Readings B	eneath Inner	Cap (ppm cg	 		•		pen Interval B		_	(ft BGS)	40 3	≮ ′ (ft BMP)
Pump and Tu	ıbing Typ	e: QED San	nple Pro (blade	der) with poly t	tubing		Pump Intake	Depth:		(ft BGS)	37.5	**	(ft BMP)	MP Description		
Equipment D	econ. Me	thod: 3 Bud	ket Rinse with	Liquinox		*	Depth to Wa	ter Before Pu	ımp Installatio	n (ft BMP):	28,46	Time:	1191	GW Disposal	I: GW-11 Pond	
	PURGING		emp.	р			nductivity		d Oxygen		Potential		bidity	Purge	Depth to	Cum. Vol.
	집		°C)	(pH L			/cm)	Horr bary	mg/L)		(mV)		TU)	Rate (ml/min)	(ft BMP)	Purged (ml)
Time	S &	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*			READ	CHANGE*	READ	CHANGE*			
1405	X_	27.83		7.15		6.24		1.51/0.	73	88		81,4		200	25,30	0
1410_	X	26.78		7.19		6.57		058/0:	74	83	ļ	25,3		200	28,69	16
1415	X	26,54		7,27		6.65		054/0	168	76		18.9		200	28.70	26
1420	X^{\prime}	25.86		7.27		6.72		0.43/0	H	74		3.0		200	28,70	34
1420 1425 1430	X	25.78		7.26		6.74		0,41/0	63	74		0.1		200	28,70	41
1430	X	25.67	1	7,26	/	676		0.35 0.	61 /	フネ		0,0		200	28.70	54
1435	X	25.59	J	7,24		6,80		0,39/01		72		0,0			28.69	64
		J. J. J.							,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			01				
					\											
	 		/					/	/							
-										1.				1011	[
	1								 	 	1		10k	0		
								<u> </u>					() P	10/4/17		
	+								+		 					
Sample ID:	LIEMI	1-ALT.	-201710	04	Duplicate ID): <u> </u>	1/4	1		QA/QC San	noles/ID:	NIA			COC Time: /	142-
Sa	imple Co	ontainer	#/1/10	· ·		, , ,	77-	Material C	odes: VOA =		-	er Glass; CG	=Clear Glass		lene; O=Other (
	Materia								ontamination:		Field Filtered		COC Number			` <u> </u>
Number	Code	Volu	me Pre	eservative	Intended	Analysis and/	or Method	Comment	s:	,						· "
									-Ferrous from	WA						
lastin 6	_		ty Study Sa	mpling Bott	le Set				Sellido	•						
AP	A	144							Canumahaan		cloar					
-	-							Signatur	elsh: /2	r color is	(lear	•	_			
INDICATO	R PARA	METERS	HAVE STABL	IZED WHEN	N 3 CONSFO	CUTIVE REA	ADINGS AR		~(~)·	$ \nearrow $			~			
									ledox Pote	ential:	± 10% for	<u>Dissolve</u>	d Oxvaen	and Turbi	idity	
				C Continent					lierom/Litor						OA Quality A	Acuronea.

					L	JVV FL	JW GR	עאטט	WAIER	SAMP	LING LU	/G		N'	ERT, Henders	son, NV Projec
Task Name:		Treatment Tre	eatability Stud	Y AP Ares	Task Manag	er : Anil Ayya	cwami G.	Roemy	/	Task No: #	H2-M13		9	Well ID: CT	WHALS UF	MW-06D
Field Sample	ers: Jeff l	Richeson								Recorded b	by: Jeff Richeso	on		Date: /	0/4/1-	7
Well Depth (ft BGS):	100	MP D	istance AGS (f	it):		Well Depth ((ft BMP):_23	78 50	Screened/0	Open Interval T	ор: –		(ft BGS)	45	(ft BMP
Well Diamet	er (in):	て	PID/F	ID Readings B	Jeneath Inner	Cap (ppm cg	e akb):	_		Screened/0	Open Interval B	ottom:		(ft BGS)	50	ft BMP
Pump and T	ubing Ty	pe: M cga M	Pump	with Poly Tubi	ng - Block	ter Pump	Pump Intake	Depth: 4	7.5	(ft BGS)		199	(ft BMP)	MP Descripti	ion: TOC	
			cket Rinse wit		237				ump Installatio	n (ft BMP):	28.75	Time:	1100	GW Disposa	I. GW-11 Pond	
	PURGING SAMPLING	Те	emp. (*C)		H Units)		nductivity /cm)	Dissolv	red Oxygen (mg/L)	The state of the s	Potential P (mV)	The second secon	oidity TU)	Purge Rate	Depth to Water	Cum. Vol. Purged
_Time	PUR	READ	CHANGE*	READ	CHANGE*	READ	CHANGE*	READ		READ	CHANGE*	READ	CHANGE*	(ml/min)	(ft BMP)	(ml)
1235	Y	2b.97		7.52		5.92		1981	1.54	61		801		200	3887	0
1240	X	2697		7.33		5,90		1.14/0		73		340.		200	29.10	14
1245	X	26.80	7	7.31		5.91	100 100 100 1	0.79	1-1	73		194		200	29/11	21
	X	26,78		736		5.91		0.70/	10.00	68		11/			29/10	
1250	X			7,44				-21	112		-	0		200	29.08	34
1355	X	26.80				5,93		0.591		62	-	70,0		200		7-1
1300	0	26.85		7.49		5,94		0,56%	2,6/	60	-	63.1		1850	29.10	56
1305	X	26.86		7.50		5.96		0,59	0165	57		28,2		200	29.08	61
1310	X	26.76		7.52		5.97		0,48/	0,64	54		1816			29,10	76
1315	X	26.77		7.52		5,97		0.44/	262	51		13.2		200	29,07	SL
1320	X	26.73		7.52		5197		04110	2.62	50	1	9.9		200	29,07	96
1325	7	26.72		7.51		5,97	/	0.421		49	/	9,7	/	200	29,09	10L
1330	X	26.76		7.51	√	5.97		- cref I	262	44		9,0	V	200	29,10	11 4
1			_					, ,1			,	1				
								_	1	14	0/4/17			\		
												<u></u>				
Sample ID:	UFM	W-06D-	201710	04	Duplicate ID:	:				QA/QC San	nples/ID:	MA			COC Time:	1330
Sa	ample C	ontainer						Material	Codes: VOA = 4			r Glass; CG =	Clear Glass;		ene; O=Other (
	Materia	- 1	0.0						contamination:	N	Field Filtered	N Ø	COC Numbe	r:	22 (<u>55</u>)	
Number	Code	Volur	me Pre	eservative	Intended /	Analysis and/o	or Method	Commen		100				25-	1.00	
1 011 - 0			0.10						Ferrous Iron		. #					
IN SILL ON	ORMERS	i reatabilii	ty Study Sa	mpling Bottl	e Set			1	-Suffice =		1-e ar					
MAP	PV	9						ļ.	0		Maria	5				
								Signatur	Groundwater	COIOTIS	Con Co	7.				
*INDICATO	R PARA	METERS H	HAVE STARI	IZED WHEN	3 CONSEC	LITIVE REA	DINGS AP	Signatu		-			~			
1 1000000000000000000000000000000000000									Redox Pote	ntial:	± 10% for I	Dissolved	Oxygen	and Turbi	dity	
BGS	- Below C	Ground Surfa	ice	C - Centigrade	е	GS - Grour			lligram/Liter	min - Mini		MP - Measuri			QA - Quality As	SSUrance
BMP	- Below N	Measuring Po	oint	COC - Chain	of Custody	ID - Identifi		mV - milli		ml - millili			lometric Units		QC - Quality C	

Appendix F Permits

STATE OF NEVADA



Department of Conservation & Natural Resources

Brian Sandoval, Governor Leo M. Drozdoff, P.E., Director David Emme, Administrator

August 16, 2016

Andrew W. Steinberg Nevada Environmental Response Trust 35 E. Wacker Drive, Suite 1550 Chicago, IL 60601

RE: Long-Term UIC General Permit GU07RL-51056

Nevada Environmental Response Trust Site, Henderson NV - Soil Flushing

Mr. Steinberg:

The Bureau of Water Pollution Control (BWPC) has reviewed your Notice of Intent (NOI) for inclusion under the long-term remediation underground injection control (UIC) General Permit GU07RL. Based on the NOI, authorization for inclusion under the permit is granted and your ID number is 51056. You had submitted a Notice of Intent for a short-term general permit for pilot testing, however, the BWPC has determined to not issue the short-term permit and issue this long-term permit for pilot and full-scale activities. BWPC pre-approval is not required for installation of any future injection wells; however, please report new well installation in UIC reports.

I have enclosed a signed copy of the general permit authorizing the activities as identified in the approved workplan. The responsible party must meet all conditions related to the activity category of this permit. Any additional injection activities not included in the application and workplan will require submission of a new NOI and workplan for UIC approval.

Please note the following sections of the permit:

- 1. UIC Reports will be due semi-annually starting February 15, 2017, and be due every February and August thereafter as described in permit.
- 2. The issue date of the permit is August 16, 2016, and does not expire until the permit is cancelled (using UIC Form U310);
- 3. The maximum injection rate is higher by 10 gpm to allow for slight exceedances of the requested maximum rate of 250 gpm and avoid non-compliance. Same for pressure limit 30 psi requested, 35 psi limit.
- 4. I.A.1 Authorized injectate is identified on the cover of the permit;
- 5. Monitoring reports are required under section Part I.A.6.

If you have any questions or comments, please contact me at (775) 687-9428 or rland@ndep.nv.gov.

Sincerely,

Russ Land

Bureau of Water Pollution Control

Run fand

Enclosures: UIC Permit GU07RL-51056

ecc: Guy Roemer, Tetra Tech, Inc.

James Dotchin, Carlton Parker, Weiquan Dong, NDEP BISC

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

UIC GENERAL PERMIT GU07RL ID# 51056 LONG TERM REMEDIATION – More than six months

AUTHORIZATION TO INJECT

In compliance with the provisions of the Nevada Revised Statutes (NRS) and the Nevada Underground Injection Control (UIC) Regulations, Nevada Administrative Code (NAC) 445A.810 through 445A.925, eligible applicants are authorized to inject the following compounds and/or water from a treatment facility operated in conjunction with a Corrective Action (CA) project overseen by the Nevada Division of Environmental Protection Bureau of Corrective Actions or other CA agency into Class V injection wells in accordance with limitations, requirements and other conditions set forth in Parts I and II hereof.

This General Permit is for Corrective Action (remediation) projects lasting **more than six months** and allows injection of 1) those materials identified below in Category 1 and/or 2) water which has been treated to meet groundwater quality criteria.

Facility/Site Name: Nevada Environmental Response Trust (NERT) Site									
Facility Address: 510 South Fourth Street, Henderson, Clark County NV									
Legal Description: <u>T22S R62E Sec 12</u>									
Well Owner Name: Nevada Environmental Response Trust									
Address: 35 E. Wacker Drive, Suite 1550, Chicago, IL 60601									
Operator Name & Address: Tetra Tech, 1489 W. Warm Springs Rd Ste 110,	, Henderson NV 89014								
Authorized injection wells: Two hundred fifty two (252) injection wells									
Authorized rates/volumes: maximum 260 gallons per minute (gpm) water/solution at maximum 35 psi injection pressure; up to 354 lbs of Calcium Polysulfide, electron donors and 8 lbs of tracer dyes as described in the Notice of Intent. Required for Quarterly sampling: Per approved State or County Corrective Action Workplan See UIC permit issuance cover letter Approved plan date: July 2016 Additional UIC Sampling required:									
Additional OIC Sampling required:									
Coverage under this general permit will be authorized if a Notice injection occurs at a specific site:	e of Intent (NOI) is submitted and the following								
CATEGORY 1 - One of the following is injected:									
\Box Low-percentage solution of hydrogen peroxide (H ₂ O ₂). Injection sl	hall not exceed 350 gallons/well per month;								
□ Potassium and sodium permanganate;	X Sulfate or Polysulfide;								
□ Ozone;	X Nutrients: nitrate, ammonia, phosphate, vitamins;								
□ Oxygen infusers;	☐ Hydrogen releasing compounds;								
X Carbon sources/electron donors (including, but not limited to aceta	ate, lactate, glucose, and complex sugars);								
□ Surfactant	☐ Chemical oxidation compounds								
<u>CATEGORY 2</u> - Injection of water that has been treated to meet ground	ndwater quality criteria.								
Modifications to the above requirements must be pre-approved be Permittee shall comply with all provisions of this permit and any									
This general permit was issued on October 10, 2012. This general									
Effective date for the project above is: August 16, 2016. The authorization issued under this permit shall expire									
at midnight 5 years from the issue date.									
Signed this 16 th day of August, 2016.									
Russ Land									
Bureau of Water Pollution Control									

PART I

A. LIMITATIONS, MONITORING AND OTHER REQUIREMENTS

Subject to the Nevada Administrative Code (NAC) 445A.894, the director may require any person authorized to inject by a general permit to apply for and obtain an individual permit. Upon review of the facts, if the Underground Injection Control (UIC) Program staff is concerned about any aspects of the project (such as a public water system supply well or domestic well), the applicant may be required to obtain an individual permit and application will be processed as a UIC UNEV permit. The Permittee is only authorized to inject what is listed on page 1 of this permit; any actions other than the discharges listed will require an individual UIC UNEV Permit. If an individual permit is issued to a person holding a general permit for the same activity and discharge points, the general permit is automatically terminated on the effective date of the individual permit.

- 1. During the period beginning on the effective date of this permit for a specific project and lasting through the expiration date, the Permittee is authorized to inject:
 - a. <u>CATEGORY 1</u>: Compounds which are injected into a well for remediation purposes per approved rates specified and authorized on page 1; and/or
 - b. **CATEGORY 2**: Water that has been treated for remediation purposes to meet groundwater quality criteria.
- 2. Injection shall not occur in a well that has had free product light non-aqueous phase liquids (LNAPL) and/or dense non-aqueous phase liquids (DNAPL)) during the previous 3 months.
- 3. Extraction, treatment, and injection must prevent introduction of any foreign materials or unapproved additives to the injection zone. The use of any other additive(s) requires written authorization from the Nevada Division of Environmental Protection (the Division) prior to injection. Sodium thiosulfate utilized to dechlorinate potable water may be used for injection under this general permit.
- 4. Injection practices shall not cause injectate and/or groundwater to surface at or near the injection points, nor cause any physical, biological, or chemical degradation of groundwater pursuant to the UIC regulations. Surface discharges are not authorized by this permit. Injection practices shall not cause objectionable odors or any surface hazards.
- 5. The injectate shall be limited and groundwater monitored by the Permittee, pursuant to the criteria listed below.
 - a. Only the approved compounds or water extracted and/or generated on-site shall be injected, and only in the volumes and at the injection rates authorized following appropriate treatment to meet groundwater quality criteria. Other water generated as part of the facility's CA project may also be authorized under this permit. These additional waters shall be produced from an on-site activity, treated to meet groundwater quality criteria, and receive prior Division approval. All facilities encompassed by this permit shall conform to the plans and specifications filed with the Division and shall be maintained in good working order at all times.
 - b. Monitoring and reporting shall be conducted pursuant to the following: 1) the approved Corrective Action Workplan; 2) the corresponding category sampling required in Part I.A.6.; and 3) any additional UIC monitoring requirements identified on page 1 of this permit.
 - c. A laboratory certified by the state of Nevada must perform analyses. Testing methods for constituents must be EPA or Division approved. It must be clearly stated on all reports which analyses were performed.
 - d. The analytical method reporting limits for all chemical constituents must be at least as low as primary or secondary drinking water standards when applicable.

e. The Division may decrease or increase the monitoring of any parameter for good cause.

6. Monitoring and Reporting Requirements:

The Permittee shall submit semi-annual reports (August and February) in accordance with Part I.A.7. for UIC activities in a UIC Summary Report submitted to the UIC Program on a continuous basis, whether actively injecting or not.

The required sampling type, frequency and location are based on the discharge category, as follows:

Table 1: Category 1 - Compound Injection

Parameter and Location	Frequency	Limitations	Sampling Location
Injection volume/mass (gallons/pounds per well per month)	Total monthly	See authorization on page 1	Injection well
Solution Ratio (%)	Each injection event	See authorization on page 1	Injection well

Table 2: Category 2 - Pump and Treat

Parameter and Location	Frequency	Limitations	Sampling Location
Injectate Flow Rate (gpm)	Total monthly	See authorization on page 1 (daily average)	Injection well
UIC Sample List 3 – Organics (Attachment I)	Day 7 & 90 of pumping / injection (including restart), Annually thereafter	Monitor and Report	Inlet of treatment system
UIC Sample List 3 – Organics (Attachment I)	Day 7 of pumping / injection (including restart), Quarterly thereafter	Drinking Water Standards	Outfall of treatment system
Depth to Groundwater (feet)	Quarterly	Monitor and Report, water level shall not rise to within three (3) feet of ground surface.	
Groundwater Elevation (amsl)	Quarterly	Monitor and Report	

gpm: Gallons per minute

amsl: Above mean sea level

- a. The UIC Summary Report shall at a minimum contain the following:
 - 1. UIC General Permit and unique ID number.
 - 2. Reporting period: semi-annual period and year; and date submitted.
 - 3. Individual/company reporting.
 - 4. Project name and address.
 - 5. Corrective Action Case Officer name and Facility ID #.
 - 6. Identify which wells were used for injection, which wells were used for extraction (if applicable) and injection rate, volume, date, time and concentration of the

- substance injected. If no injection occurred, state so in report.
- 7. The results of the sampling analyses and monitoring as required by the tables above.
- 8. Is free product present on-site? If free product is encountered, indicate free product type(s) and date(s) observed.
- 9. Brief summary detailing normal and any unusual activities.
- 10. Statement that all required CA Reports have been provided to the appropriate regulatory agency.
- 11. Name, title and signature of authorized reporting individual.
- 12. The UIC Summary Report for Category 1 injection shall be no longer than two (2) pages.
- 13. The UIC Summary Report for Category 2 injection is recommended to be no longer than five (5) pages.

The chain-of-custody documents and laboratory analytical data shall not be submitted with the UIC Summary Report. These documents shall be held on site and made available upon request by the Division.

7. Monitoring results and other requirements obtained during the previous reporting period, whether injection has occurred or not, shall be summarized for each month and reported <u>no later than 45</u> <u>days</u> following the end of the reporting period (January-June, July-December).

Signed copies of <u>only</u> **the UIC Summary Report** shall be submitted to the UIC program at the following address:

Nevada Division of Environmental Protection Bureau of Water Pollution Control Attn: Injection Monitoring Report 901 South Stewart Street, Suite 4001 Carson City, Nevada 89701

- 8. If, during operation of this facility, the Permittee or their representatives become aware of any condition which degrades the quality of the aquifer (outside of the treatment zone for injection), injection shall cease immediately and the UIC Program shall be notified pursuant to Part II.B.2.
- 9. Monitoring and system management shall continue for a period of not less than one year following remedial system shutdown approval. Decisions regarding terminating Corrective Actions (remediation) per NAC 445A.22745 and decisions regarding no further action for the Site per NAC 445A.22725 will be made by the BCA or state-authorized county programs after monitoring groundwater conditions for a minimum of one (1) year per NAC 445A.22745 (2).

A request may be submitted to the UIC program to cease reporting during the one year monitoring period, or to cancel the UIC permit. Permittee must notify the UIC Program in writing of this request; and for cancellation, must indicate their understanding of the consequences of cancellation prior to receiving final closure approval. Following an evaluation by the UIC Program, the Permittee will be notified in writing granting cancellation or denial of cancellation with rational for such action. Requests for cancellation must contain: 1) Either certification of well abandonment OR written confirmation from a regulatory agency for continued use as monitoring wells on a well by well basis; 2) final UIC monitoring report; and 3) Notice of Termination U310 Form 4) any affidavits not already on file in UIC permit. Any wells that are not needed for monitoring are required to be properly abandoned prior to UIC permit cancellation.

10. The Permittee shall operate and maintain the system per established procedures and as approved by the Division. Any modification to the injection practices which is not approved on page 1 of

this permit requires submission of changes and re-issuance of this permit by the UIC Program prior to implementation.

- 11. Nothing in this authorization shall be construed to eliminate the responsibility for remediation of this site. Remediation shall be accomplished in accordance with plans approved by the BCA, or other State-approved corrective action program.
- 12. All facilities encompassed by this permit shall conform to the plans and specifications filed with the UIC Program and shall be maintained in good working order at all times.
- 13. The Permittee shall submit the annual review and services fee in accordance with NAC 445A.872 starting **July 1st** of the year immediately following permit issuance and every year thereafter while the Permittee is authorized to inject under the general permit.
- 14. The Permittee shall comply with all provisions of the UIC regulations, NAC 445A.810 through 445A.925, and all pertinent laws and regulations. Nothing in this permit relieves the Permittee from responsibilities, liabilities or penalties established by any other state, federal or local jurisdiction.
- 15. Upon completion of the remediation project, all wells shall be abandoned pursuant to current Division of Water Resources (DWR) regulations (NAC 534) and by UIC regulations by filling them with cement grout from total depth to land surface. A driller licensed in the state of Nevada shall perform all abandonment work.

B. SCHEDULE OF COMPLIANCE

- 1. The Permittee shall implement and comply with the provisions of the schedule of compliance after approval by the Administrator, including in said implementation and compliance, any additions or modifications which the Administrator may make in approving the schedule of compliance.
 - a. The Permittee shall achieve compliance with the conditions, limitations and requirements of the permit at the commencement of relevant activity.
 - b. The Permittee shall submit any items listed in this General Permit issuance letter as required.

PART II

A. RECORDKEEPING AND OTHER MONITORING REQUIREMENTS

1. Sampling and Test Procedures

Samples and measurements taken as required herein shall be representative of the volume and/or nature of the subject of interest. Test procedures for the analyses of required constituents shall comply with applicable analytical methods cited and described in Tables IA - IE of 40 CFR part 136 or in Appendix III of 40 CFR part 261 unless the Administrator approves other procedures.

A laboratory certified by the state of Nevada must perform all analyses conducted pursuant to permit requirements.

2. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the Permittee shall record the following information:

- a. Chain-of-custody sheets with the exact place, date, and time of sampling;
- b. The dates the analyses were performed;
- c. The person(s) who performed the analyses;
- d. The analytical techniques or methods used;
- e. The results of all required analyses;
- f. The precision and accuracy of the analytical data; and
- g. Raw laboratory data result sheets.

3. Additional Monitoring by Permittee

If the Permittee monitors any constituent at the location(s) designated herein more frequently than required by this permit, or monitors additional constituents other than those required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be made available to the Division.

4. Records Retention

All records and information resulting from the monitoring activities required by this permit, including all records and analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years, or longer if required by the Administrator.

5. Modification of Monitoring Frequency, Location and Sample Type

After considering monitoring data, discharge flow or receiving water conditions, the Division may, for just cause, modify the monitoring frequency, location and/or sample type by issuing a Notice or an Administrative Order to the Permittee.

B. MANAGEMENT REQUIREMENTS

1. Change in Effluents or Discharge

All effluents or discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any constituent identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, or treatment modifications which will result in new, different, or increased effluents or discharges must be reported by submission of a new application or, if such changes will not violate the limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any constituents not previously limited.

2. Noncompliance Notification

If, for any reason, the Permittee does not comply with or will be unable to comply with the conditions, requirements and limitations specified in this permit, the Permittee shall provide the Administrator with the following information, in writing, within five (5) days of becoming aware of such conditions:

- a. A description of the noncompliance or violation.
- b. The period of noncompliance, including exact dates and times, or if not corrected, the time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncompliance.
- c. Notification shall be provided verbally as soon as possible but not later than the end of the first working day after learning of the violation.

3. Facilities Operation

The Permittee shall at all times maintain in good working order and operate as efficiently as possible, all treatment or control facilities, devices or systems installed or used by the Permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The Permittee shall take all reasonable steps, including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying effluent or discharge, to minimize any adverse impact to waters of the State resulting from noncompliance with any limitations specified in this permit.

5. Bypass

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited except where unavoidable to prevent loss of life or severe property damage. The Division will have the final authority in the determination of whether a discharge is deemed unavoidable. The Permittee shall promptly notify the Administrator in writing of each such diversion or bypass, in accordance with the procedure specified in Part II.B.2 above.

C. RESPONSIBILITIES

1. Right of Entry

Pursuant to NRS 445A.655, the Permittee shall allow the Administrator and/or his authorized representatives, upon the presentation of credentials:

- a. To enter upon the Permittee's premises where a source is located or in which any records are required to be kept under the terms and conditions of this permit;
- b. To have access to and copy any records required to be kept under the terms and conditions of this permit;
- c. To inspect any monitoring equipment or monitoring method required in this permit; and
- d. To perform any necessary sampling to determine compliance with this permit or to sample any effluent or discharge.

2. Transfer of Ownership or Control

In the event of any change in ownership or control, the Permittee shall notify the succeeding owner of the existence of this permit, in writing, at the earliest possible date to allow sufficient time for the succeeding owner to demonstrate financial responsibility to the Division within 30 days prior to transfer of ownership. The letter shall include the date agreed upon by both parties for the transfer of ownership. A copy of the letter shall be forwarded to the Administrator. The Administrator of the Division of Environmental Protection shall approve all transfers of permits. The Administrator may require modification, or revocation with subsequent reissuance of the permit, to change the name of the new Permittee and incorporate additional requirements as deemed necessary due to any changes made to the injection wells or system by the new Permittee.

3. Availability of Reports

Except for data determined to be confidential under NRS 445A.665, all reports prepared in accordance with the terms of this permit shall be available for public inspection. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in NRS 445A.710.

4. Permit Modification, Suspension or Revocation

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the effluent or discharge.

5. Civil and Criminal Liability

- a. Nothing in this permit shall be construed to relieve the Permittee from civil or criminal penalties for noncompliance.
- b. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.
- c. The issuance of this permit does not convey any property rights, in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, State or local laws or regulations.

Nevada Division of Envir	onmental Protection	
Underground Injection Control Program -	Sampling and Monitoring Report Form	
Facility Name :	Depth of sampled water's origin :	
Facility Owner:	County:	
NDEP UIC Permit #:	Location: Lattitude Longitude	,
Well ID#:	Sampler:	
Type of Well: Monitor Production Injection	Date Sampled :	

UIC Sample List 3 - Organic EPA Method 8260B (page 1 of 2)

Method M	Parameter	IRIS RfD	DW Health Advisories	DW Standards	DW Standards	Measured
Acetore 100 1,00	T di dilletei		1			1
Dichlorodifluoromethane (Freon 12) 200 1,000	Acetone		ug/L	IIIg/L	ug/L	values
Chloromethane			1,000			
Vinyl chloride 0.002 2 Chloroethane 0 0 Bromomethane (Methyl Bromde) 1 10 Trichlorofluoromethane (Freon 11) 300 2,000 1,1-Dichloroethene 0.007 7 Tertlary Butyl Alcohol (TBA) 0.005 5 Dichloromethane (Methylene chloride) 0.005 5 Viran-1,2-Dichloroethene 0.1 100 Methyl Iert-butyl ether (MTBE) 0.20 or 0.020* 200 or 20 1,1-Dichloroethane 0.07 70 Di-Isopropyl Ether (DIPE) 0.005 0.007 70 Bromomethane (TDE) 0.007 70 0.007 70 Bromomethane 13 90 0.007 70 0.007 70 0.007 70 0.008 80 0.007 70 0.008 80 0.007 70 0.008 80 0.008 80 0.008 80 0.008 80 0.008 80 0.008 1.008 0.008 1.008 0.008 0.008						
Chloroethane			3	0.002	+	
Bromomethane (Methyl Bromide) 1				0.002		
Trichlorofluoromethane (Freon 11) 300 2,000 0,007 7		1	10			
1,1-Dichloroethene						
Tertiary Butyl Alcohol (TBA)			2,000	0.007	7	
Dichloromethane (Methylene chloride) 0.005 5 1 1 1 1 1 1 1 1				0.007	- '	
tran-1,2-Dichloroethene 0.1 100 Methyl tert-butyl ether (MTBE) 0.20 or 0.020* 200 or 20 1,1-Dichloroethane 0.07 70 Di-isopropyl Ether (DIPE) 0.07 70 cis-1,2-Dichloroethene 0.07 70 Bromochloromethane 13 90 Chloroform 0.08 80 Ethyl Tertiary Butyl Ether (ETBE) 2,2-Dichloropropane 0.005 5 1,2-Dichloroethane 0.005 5 1,1,1,1-Trichloroethane (TCA) 0.2 200 1,1,1-Dichloropropane 0.005 5 5 1 Tertary Amyl Methyl Ether (TAME) 0.005 5 5 Dibromomethane 0.005 5 5 1,2-Dichloropropane 0.005 5 5 Trichloroethene (TCE) 0.005 5 5 Berzendichloromethane 0.005 5 5 Trichloroethene (TCE) 0.005 5 5 Berzendichloromethane 0.005 5 5 T				0.005		
Methyl tert-butyl ether (MTBE) 0.20 or 0.020* 200 or 20 1,1-Dichloroethane 0.20 or 0.020* 200 or 20 D-isopropyl Bher (DIPE) 0.07 70 Bromochloromethane 13 90 0.08 80 Bryl Tertiary Butyl Bher (ETBE) 0.08 80 0.005 5<						
1,1-Dichloroethane Di-isopropyl Bher (DIPE) cis-1,2-Dichloroethene Bromochloromethane 13 90 Chloroform 0,008 80 Bhyl Tertiary Butyl Bher (ETBE) 2,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,1,1-1-Tichloroethane (TCA) 1,1,1-Tichloroethane (TCA) 1,1,1-Tichloroethane (TCA) 1,1-Dichloropropene Carbon tetrachloride 0,005 5 Benzene Carbon tetrachloride 0,005 5 Tertiary Arnyl Methyl Bher (TAME) Dibromomethane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,2-Dichloropropane 1,1,2-Tichloroethane 1,2-Dichloropropane 1,1,2-Tichloroethane 1,2-Dichloropropane 1,1,1,2-Tichloroethane 1,1,2-Tichloroethane 1,1,2-Tichloroethane 1,1,2-Tichloropropane 1,1,1,1,1-Tichloropropane 1,1,1,1,1,1-Tichloropropane 1,1,1,1,1,1-Tichloropropane 1,1,1,1,1,1,1-Tichloropropane 1,1,1,1,1,1,1-Tichloropropane 1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,						
Discription Discription				0.20 01 0.020	200 01 20	
Cis-1,2-Dichloroethene 13 90 90 90 90 90 90 90 9						
Bromochloromethane				0.07	70	
Chloroform		13	90	0.07	70	
Bhyl Tertiary Butyl Ether (ETBE)			30	0.08	80	
2,2-Dichloropropane 0.005 5 1,2-Dichloroethane 0.005 5 1,1-Trichloroethane (TCA) 0.2 200 1,1-Dichloropropene 0.005 5 Carbon tetrachloride 0.005 5 Benzene 0.005 5 Tertiary Amyl Methyl Ether (TAME) 0.005 5 Dibromomethane 0.005 5 1,2-Dichloropropane 0.005 5 Bromodichloromethane 0.005 5 cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 0.005 5 Toluene 1 1,000 1,3-Dichloropropane 0.005 5 Dibromochloromethane 0.060** 60** 1,2-Dibromoethane 0.0005 0.5 Tetrachloroethene (PCE) 0.0005 5 1,1,1,2-Tetrachloroethane 0.1 100 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700				0.00	- 00	
1,2-Dichloroethane 0.005 5 1,1,1-Trichloroethane (TCA) 0.2 200 1,1-Dichloropropene 0.005 5 Carbon tetrachloride 0.005 5 Benzene 0.005 5 Tertiary Amyl Methyl Eher (TAME) 0.005 5 Dibromomethane 0.005 5 1,2-Dichloropropane 0.005 5 Bromodichloromethane 0.005 5 Bromodichloromethane 0.0** 0.0** cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 1 1,000 1,3-Dichloropropane 1 1,000 Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 0.1 100 Chlorobenzene 0.1 100 Bhylbenzene 0.7 700						
1,1,1-Trichloroethane (TCA) 0.2 200 1,1-Dichloropropene 0.005 5 Carbon tetrachloride 0.005 5 Benzene 0.005 5 Tertiary Amyl Methyl Ether (TAME) 0.005 5 Dibromomethane 0.005 5 1,2-Dichloropropane 0.005 5 Trichloroethene (TCE) 0.005 5 Bromodichloromethane 0.0** 0.0** cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 0.005 5 Toluene 1 1,000 1,3-Dichloropropane 0.060** 60*** Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 0.1 100 Chlorobenzene 0.1 100 Bhylbenzene 0.7 700				0.005	5	
1,1-Dichloropropene 0.005 5 Benzene 0.005 5 Tertiary Amyl Methyl Ether (TAME) 0.005 5 Dibromomethane 0.005 5 1,2-Dichloropropane 0.005 5 Trichloroethene (TCE) 0.005 5 Bromodichloromethane 0.0** 0.0** cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 0.005 5 Toluene 1 1,000 1,3-Dichloropropane 0.060** 60** Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 0.1 100 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	1,1,1-Trichloroethane (TCA)					
Benzene						
Benzene 0.005 5	Carbon tetrachloride			0.005	5	
Tertiary Amyl Methyl Ether (TAME)	Benzene					
Dibromomethane 0.005 5 1,2-Dichloropropane 0.005 5 Trichloroethene (TCE) 0.005 5 Bromodichloromethane 0.0** 0.0** cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 0.005 5 Toluene 1 1,000 1,3-Dichloropropane 0.060** 60** Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.0005 5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	Tertiary Amyl Methyl Ether (TAME)					
Trichloroethene (TCE)	Dibromomethane					
Trichloroethene (TCE) 0.005 5 Bromodichloromethane 0.0** 0.0** cis and trans-1,3-Dichloropropene 30 0.4 1,1,2-Trichloroethane 0.005 5 Toluene 1 1,000 1,3-Dichloropropane 0.060** 60** Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	1,2-Dichloropropane			0.005	5	
Bromodichloromethane	Trichloroethene (TCE)					
cis and trans-1,3-Dichloropropene 30 0.4 0.005 5 1,1,2-Trichloroethane 1 1,000 1 Toluene 1 1,000 1 1,3-Dichloropropane 0.060** 60** 60** 1,2-Dibromoethlane 0.060** 60** 0.5 1,2-Dibromoethane (EDB) 0.00005 0.5 0.5 Tetrachloroethene (PCE) 0.005 5 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 0.1 100 Chlorobenzene 0.7 700 0.00 </td <td>Bromodichloromethane</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Bromodichloromethane					
Toluene	cis and trans-1,3-Dichloropropene	30	0.4			
Toluene 1 1,000 1,3-Dichloropropane 0.060** 60** Dibromochloromethane 0.00005 0.5 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	1,1,2-Trichloroethane			0.005	5	
Dibromochloromethane 0.060** 60** 1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethane (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	Toluene			1		
1,2-Dibromoethane (EDB) 0.00005 0.5 Tetrachloroethene (PCE) 0.005 5 1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	1,3-Dichloropropane					
Tetrachloroethene (PCE)	Dibromochloromethane			0.060**	60**	
1,1,1,2-Tetrachloroethane 30 1-70 Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	1,2-Dibromoethane (EDB)			0.00005	0.5	
Chlorobenzene 0.1 100 Ethylbenzene 0.7 700	Tetrachloroethene (PCE)			0.005	5	
Ethylbenzene 0.7 700	1,1,1,2-Tetrachloroethane	30	1-70			
	Chlorobenzene			0.1	100	
o-Xylene & m,p-Xylene 10,000***	Ethylbenzene			0.7	700	
	o-Xylene & m,p-Xylene			10.0***	10,000***	

IRIS RfD and DW Health Advisories (chronic) are from USEPA Region 9, Drinking Water Standards and Health Advisories Table, February 2004. These values are provided for guidance when there is not a Federal Maximum Contaminant Level (MCL).

^{*} State of Nevada Action Level dependant on distance to sensitive receptors.

^{**} MCLG. This compound is one of the Total Trihalomethanes whose MCL is 0.080 mg/L or 80 ug/L.

^{***} The MCL for the sum of all xylenes is 10.0 mg/L or 10,000 ug/L.

		vision of Environmental			
	Injection Con	trol Program - Sampling			
Facility Name :			Depth of sampled v	vater's origin :	
Facility Owner:			County:		
NDEP UIC Permit #:			Location :		
Well ID#:			Sampler:		
Type of Well: Monitor	Production Inj	ection	Date Sampled:		
UIC Sample List 3 -	Organic EPA	Method 8260B (page	e 2 of 2)		
Parameter	IRIS RfD	DW Health Advisories	DW Standards	DW Standards	Measured
	ug/kg-d	ug/L	m g/L	ug/L	Values
Bromoform			0**	0.0**	
Styrene			0.1	100	
1,1,2,2-Tetrachloroethane	0.05	0.2-0.3			
1,2,3-Trichloropropane	6	40			
lsopropylbenzene (cumene)	100	11,000 (acute)			
Bromobenzene		4,000 (acute)			
n-Propylbenzene					
2- and 4-Chlorotoluene (o and p)	20	100			
1,3,5-Trimethylbenzene					
tert-Butylbenzene					
1,2,4-Trimethylbenzene					
sec-Butylbenzene					
1,3-Dichlorobenzene (m)	90	600			
1,4-Dichlorobenzene (p)			0.075	75	
4-Isopropyltoluene					
1,2-Dichlorobenzene (o)			0.6	600	
n-Butylbenzene					
1,2-Dibromo-3-chloropropane (DBCP)			0.0002	0.2	
1,2,4-Trichlorobenzene			0.07	70	
Naphthalene	20	100			
Hexachlorobutadiene	2	1			
1,2,3-Trichlorobenzene					

IRIS RfD and DW Health Advisories (chronic) are from USEPA Region 9, Drinking Water Standards and Health Advisories Table, February 2004. These values are provided for guidance when there is not a Federal Maximum Contaminant Level (MCL).

tert-Butyl formate (TBF)

State of Nevada Action Level dependant on distance to sensitive receptors.

 $^{^{**}}$ MCLG. This compound is one of the Total Trihalomethanes whose MCL is 0.080 mg/L or 80 ug/L.

^{***} The MCL for the sum of all xylenes is 10.0 mg/L or 10,000 ug/L.

OFFICE OF THE NEVADA ENVIRONMENTAL RESPONSE TRUST TRUSTEE

Le Petomane XXVII, Inc., Not Individually, But Solely as the Nevada Environmental Response Trust Trustee
35 East Wacker Drive - Suite 1550
Chicago, Illinois 60601
Tel: (702) 357-8149, x104

April 4, 2017

Mr. Russ Land Bureau of Water Pollution Control Nevada Division of Environmental Protection 901 S. Stewart St., Suite 4001 Carson City, NV 89701

RE: Notification under Long-term UIC General Permit GU07RL-51056

Nevada Environmental Response Trust

Henderson, Nevada

Dear Mr. Land:

The Nevada Environmental Response Trust (NERT) maintains Long-term Underground Injection Control (UIC) General Permit GU07RL-51056, issued on August 16, 2016, for the NERT site in the Black Mountain Industrial Complex in Henderson, Nevada. The permit supports groundwater remediation being performed at the direction of the Nevada Division of Environmental Protection, Bureau of Industrial Site Cleanup (BISC). This letter provides notification to the Bureau of Water Pollution Control of new discharges to currently permitted injection wells. Notification complies with Section II.B.1 of the permit, which requires notice to the permit issuing authority for new discharges that do not violate limitations specified in the permit.

The new discharges consist of the activities described in the work plan for an in-situ chromium treatability study, approved by the BISC on June 28, 2016. The injection wells to support the in-situ chromium treatability study were part of the long-term forecast number of injection wells in NERT's July 2, 2016, Notice of Intent (NOI) application for a UIC permit, at Attachment 4, Table 1, of the NOI. Consistent with Attachment 4 of the NOI, this next phase of remediation work will consist of multiple tasks implemented to evaluate the in-situ treatment of contaminated groundwater within the Ammonium Perchlorate (AP) Area boundary shown on Figure 1 in the July 2, 2016 NOI and repeated on Figure 1 attached to this notification.

As part of the in-situ chromium treatability study, electron donors will be injected into approximately six injection wells with new downgradient monitoring wells used to assess the effectiveness of biological treatment for hexavalent chromium and other parameters, including perchlorate. The location of the in-situ chromium treatability study injection area is shown inside the AP Area boundary on Figure 1 (attached). Injections are anticipated to begin in April 2017 and are consistent with the limitations in UIC Permit GU07RL-51056 as described in Table 1, below.

Table 1. New Discharge Compliance with Terms of UIC Permit GU07RL-51056

Parameter	Current Permit Limitation	Compliance with Permit Limitation
In-situ chromium treatability study	Authorization for up to 252 injection wells	Approximately six injection wells are forecast to support the in-situ chromium treatability study portion of long-term remediation activity within the AP Area boundary.

Office of the Nevada Environmental Response Trust Trustee April 4, 2017

Parameter	Current Permit Limitation	Compliance with Permit Limitation
Injection area	Within AP Area boundary	Injection will occur in an existing retention basin, labeled In-Situ Chromium Treatability Study Area, inside the AP Area boundary (Figure 1).
Injection well construction	Quaternary Alluvium and Upper Muddy Creek Formation	Quaternary Alluvium and Upper Muddy Creek Formation
Injection rate	Maximum 260 gallons per minute	Less than 260 gallons per minute
Injection pressure	Maximum 35 psi	Less than 35 psi
Injectate ¹	Water, electron donors, sulfate or polysulfide, nutrients, sodium bisulfate, tracer dyes	Water, electron donor ² , nutrients, sodium bisulfite, tracer dyes.

¹ The July 2, 2016 NOI, Attachment 5 – Proposed Injection Program, listed electron donors with injection either continuous or pulsed at an estimated volume of 50,000 gallons over a 2-year period. The amount and type will vary based on results of bench-scale testing, field testing, and perchlorate concentrations. Based on preliminary bench-scale testing results and site-specific hydrologic parameters, NERT is planning to inject electron donors for the in-situ chromium treatability study during not more than six batch injection events over a 6- month period, with not more than 15,000 gallons of electron donor injected during each batch injection event.

NERT will submit a summary of all injection activity under UIC General Permit GU07RL-51056 as part of the next semi-annual report, due no later than August 15, 2017. If you have questions regarding this permit notification, please contact Dan Pastor, Tetra Tech Project Manager, at (303) 447-1823 or myself at (702) 960-4309 or at steve.clough@nert-trust.com.

Office of the Nevada Environmental Response Trust

Stephen R. Clough Stephen R. Clough, P.G., CEM

Remediation Director

CEM Certification Number: 2399, exp. 3/24/19

Cc (via NERT Sharefile Distribution):

James Dotchin, NDEP Bureau of Industrial Site Cleanup

Carlton Parker, NDEP Bureau of Industrial Site Cleanup

Weiquan Dong, NDEP Bureau of Industrial Site Cleanup

Christa Smaling, NDEP Bureau of Industrial Site Cleanup

Jay Steinberg, as President of the Nevada Environmental Response Trust Trustee and not individually

Andrew Steinberg, as Vice President of the Nevada Environmental Response Trust Trustee and not individually

Tanya C. O'Neill, Foley and Lardner, LLP

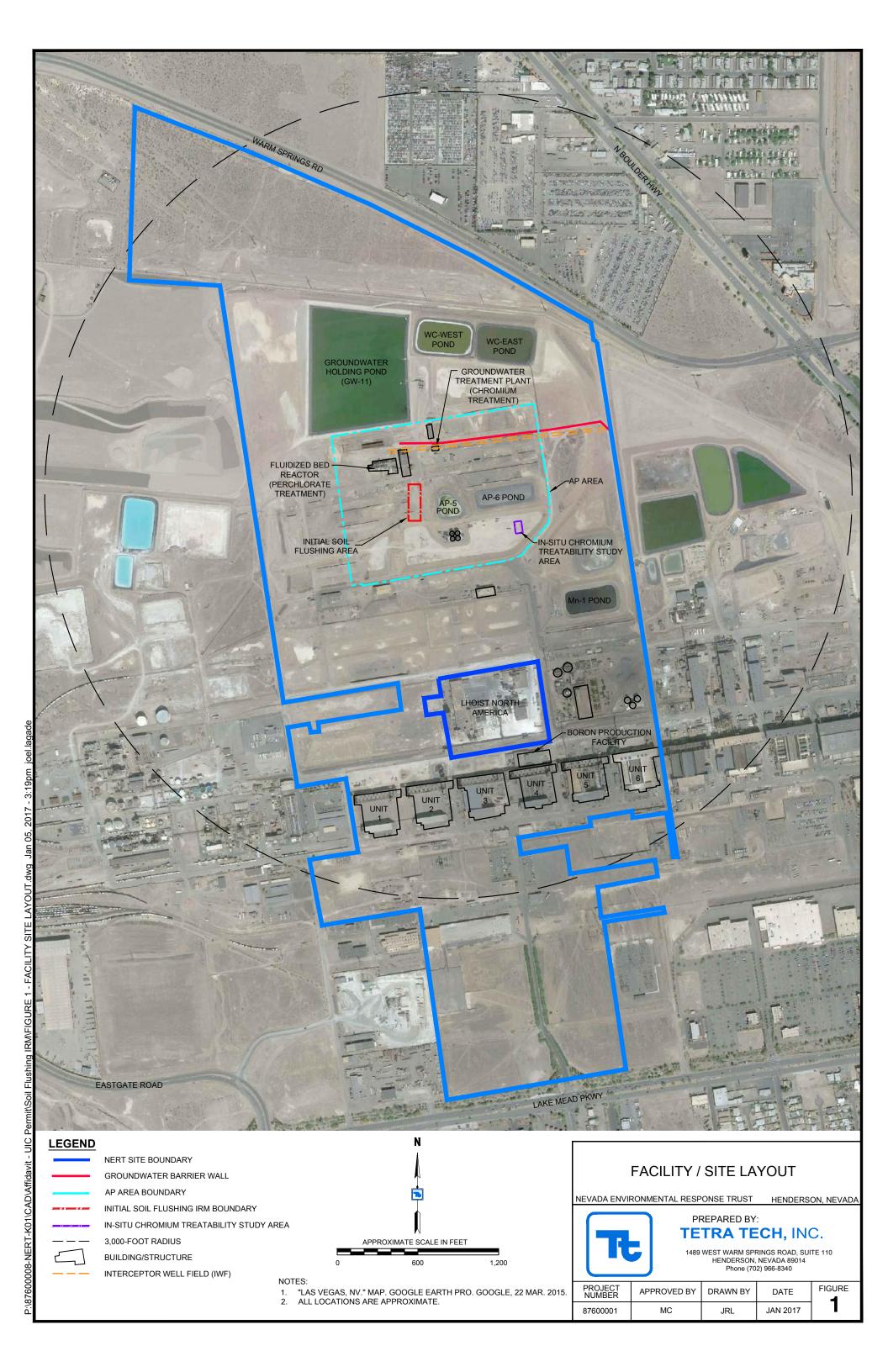
Derek Amidon, Tetra Tech

Dan Pastor, Tetra Tech

Allan DeLorme, Ramboll Environ

John Pekala, Ramboll Environ

² Electron donors may include the following, or a mixture of, molasses, industrial sugar water, and EOS, which is a water-mixable vegetable oil-based organic source of carbon for in-situ remediation.



Lenker, Carl

From: Russ Land <rland@ndep.nv.gov>
Sent: Thursday, June 01, 2017 8:44 AM

To: Brodsky, Gwen

Cc: Ayyaswami, Arul; Lenker, Carl; Pastor, Dan; Steve Clough

Subject: RE: NERT In-situ Chromium Treatability Study - sodium bicarbonate

Received, approved and filed

Thanks, Russ

Russ Land

Underground Injection Control Program

Nevada Division of Environmental Protection Bureau of Water Pollution Control 901 S. Stewart Street, Suite 4001 Carson City, Nevada 89701

p: (775) 687-9428 f: (775) 687-4684 e: rland@ndep.nv.gov www.ndep.nv.gov

From: Brodsky, Gwen [mailto:Gwen.Brodsky@tetratech.com]

Sent: Friday, May 26, 2017 8:17 AM **To:** Russ Land <rland@ndep.nv.gov>

Cc: Ayyaswami, Arul <Arul.Ayyaswami@tetratech.com>; Lenker, Carl.Lenker@tetratech.com>; Pastor, Dan

<Dan.Pastor@tetratech.com>; Steve Clough <steve.clough@nert-trust.com>
Subject: NERT In-situ Chromium Treatability Study - sodium bicarbonate

Russ,

Thank you for the phone discussion this week regarding the proposed addition of sodium bicarbonate during the NERT In-situ Chromium Treatability Study. With this email, the following addition is made to the attached April 4, 2017 notification letter under UIC Permit #GU07RL-51056, Table 1, which NDEP approved on April 4 (attached):

Injectates will include the addition of sodium bicarbonate to assist with buffering pH of the carbon substrate injections for the In-Situ Chromium Treatability Study to prevent a pH shock to the bacteria populations and because the naturally-occurring groundwater does not have sufficient buffering capacity without supplementation.

Thank you, again, for your assistance with this, Gwen

Gwen Brodsky | Planning and Permitting Lead | Energy and Mineral Services Direct (303) 448-7434 | Business (303) 664-4630 | Mobile (303) 362-3121

Tetra Tech | Complex World, Clear Solutions™

1100 South McCaslin Blvd., Suite 150, Superior, CO 80027 | tetratech.com

Biological Reduction Study

BRIAN SANDOVAL GOVERNOR

Date reviewed: June 16, 2017

BRADLEY CROWELL Director

JASON KING, P.E. State Engineer



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 · Fax (702) 486-2781 http://water.nv.gov

NOTICE OF INTENT CARD REVIEW FORM

Γο: Bob Nix		Date:	June 19	2017		
Facsimile No.:	or E-mail Address:	bnix@ca	scade-env	.com		
This document was:	✓ E-mailed	Faxed				
NOI Card Number: 39758	✓ Appro	ved		Rejected	(See reason	s below)
Work performed			missing		invalid	
Proposed use of well			missing		invalid	
Intended start date			missing		invalid	
Waiver/Permit number if applicable	:		missing		invalid	
Well location (legal description, GF	S coordinates)		missing		invalid	
Parcel number			missing		invalid	
Address at well location			missing		invalid	
Permit number			missing		invalid	
Waiver number or NDEP Facility I	D Number		missing		invalid	
Address of Client			missing		invalid	
Name of client/owner			missing		invalid	
Contractor's license number			missing		invalid	
Onsite well driller's license number	r		missing		invalid	
Drilling company name/address			missing		invalid	
Driller's signature			missing		invalid	
Replacement well			Yes		No	
If yes, existing well must l pursuant to NAC 534.300	be plugged at time to Replacement Well.	he replace	ment wel	l is drill e	ed,	
Instructions: Please note that you mus (2) 2-inch monitor wells hesitate to give our office	within 30 days of co	ne well dril mpletion. I	ler's repor f you have	t for the	installation estions, plea	of two se do not
Person reviewing NOI Card: Christi Co	ooper, waiver issued	by Tracy C	eter			

BRIAN SANDOVAL Governor

BRADLEY CROWELL Interim Director STATE OF NEVADA

JASON KING, P.E. State Engineer

JOHN GUILLORY, P.E. Supervising Engineer



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 • Fax (702) 486-2781 http://water.nv.gov

June 19, 2017

MO-3316

Bob Nix Operations Manager Cascade Drilling, LP 4221 West Oquendo Road Las Vegas, Nevada 89118

RE: Request for waiver to install two (2) temporary monitor wells to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number H-000539, located on a non-addressed parcel, just east of 510 South 4th Street, Clark County, Nevada and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith granted to install two (2) temporary monitor wells to assess water conditions as described in your request received June 16, 2017. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 16, 2017.

The two (2) proposed monitor wells referenced in your letter are listed below:

Well Name	Legal Description	GPS Coordinates (NAD 83/ WGS 84)
CTMW-05	NW1/4, SE1/4 Section 12, T.22S, R62E	36° 02' 49.25" N, -115° 00' 06.29" W
CTMW-05	NW¼, SE¼ Section 12, T.22S, R62E	36° 02' 49.22" N, -115° 00' 05.96" W

Cascade Drilling Services, LP MO-3316 June 19, 2017 Page 2

This office also waives the provisions that require a mandate to install monitoring wells, NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number H-000539, located on a non-addressed parcel, just east of 510 South 4th Street, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then these wells must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3316.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact Mr. Nicholas Brothers at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 178-12-701-004 is shown as Nevada Environmental Response Trust by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between Nevada Environmental Response Trust and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter

Drilling Supervisor

cc

File

Christi Cooper, SNBO Office

Carson City Office

Nicholas Brothers, NDEP-Permits Group, Carson City, Nevada (e-mail)

JD Dotchin, NDEP-Bureau of Industrial Site Cleanup, Las Vegas, Nevada (e-mail)

Jay A. Steinberg, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 39758 APN: 178-12-701-004 NDEP Order No. H-000539 BRIAN SANDOVAL GOVERNOR LEO DROZDOFF
Director





DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 · Fax (702) 486-2781 http://water.nv.gov

NOTICE OF INTENT CARD REVIEW FORM

To:			Date:	Decemb	er 1, 201	6	
	National EWP						
Fac	simile No.:	or E-mail Address:		ionalewp	.com	-	
	This document was:	✓E-mailed	Faxed				
NC	OI Card Number: 39157	✓Appro	ved		lejected ((See reason	s below)
	Work performed		1	missing		invalid	
	Proposed use of well		1	missing		invalid	Ц
	Intended start date		1	missing		invalid	
	Waiver/Permit number if applicable	е		missing		invalid	Ц
	Well location (legal description, Gl	PS coordinates)		missing		invalid	
	Parcel number			missing		invalid	
	Address at well location			missing		invalid	
	Permit number			missing		invalid	
	Waiver number or NDEP Facility	ID Number		missing		invalid	
	Address of Client			missing		invalid	
	Name of client/owner			missing		invalid	
	Contractor's license number			missing		invalid	
	Onsite well driller's license number	er		missing		invalid	
	Drilling company name/address			missing		invalid	
	Driller's signature			missing		invalid	
	Renlacement well			Yes		No	
	If yes, existing well must pursuant to NAC 534.300	be plugged at time t Replacement Well.	he replace	ment wel	l is drille	d,	
II	nstructions: Please note that you must (4) monitor wells within hesitate to give our office	30 days of installation	he well drill on. If you ha	ler's repor ave any q	t for the i	nstallation please do n	of four ot
P	erson reviewing NOI Card: Tracy Ge	eter					
	Date reviewed: November 30, 2016						

JASON KING, P.E. State Engineer

JOHN GUILLORY, P.E. Supervising Engineer



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

December 1, 2016

MO-3243

Bob Nix Operations Manager National EWP 4221 W. Oquendo Road Las Vegas, Nevada 89118

RE: Request for waiver to install four (4) temporary monitor wells to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number H-000539, located at 510 S. Fourth Street, Henderson, Nevada and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith granted to install four (4) temporary monitor wells to assess water conditions as described in your request received November 28, 2016. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on November 28, 2016.

The four (4) proposed monitor wells referenced in your letter are listed below:

Well Name	Legal Description	GPS Coordinates (NAD 83/WGS 84)
CTMW-01	NW1/4, SE1/4 Section 12, T.22S, R62E	36°02'48.97" N, 115°0'06.06" W
CTW-02	NW14, SE14 Section 12, T.22S, R62E	36°02'49.18" N, 115°0'05.65" W
CTIW-01S	NW14, SE14 Section 12, T.22S, R62E	36°02'48.70" N, 115°0'05.69" W
CTIW-01D	NW14, SE14 Section 12, T.22S, R62E	36°02'48.65" N, 115°0'05.35" W

National EWP MO-3243 December 1, 2016 Page 2

This office also waives the provisions that require a mandate to install monitoring wells, NAC § 534.4351 (1)(c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number H-000539, located at 510 S. Fourth Street, Henderson, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then these wells must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3243.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact Mr. Nicholas Brothers at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 178-12-701-004 is shown as Nevada Environmental Response Trust by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between Nevada Environmental Response Trust and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely.

Tracy Geter

Drilling Supervisor

cc:

File

Carson City Office

Nicholas Brothers, NDEP-Permits Group, Carson City, Nevada (e-mail)

Weiguan Dong, NDEP-Las Vegas Office, Las Vegas, Nevada (e-mail)

Jay A. Steinberg, Property Owner, Nevada Environmental Response Trust, Chicago, Illinois

ORIGINAL FILE WITH DIVISION OF	NOTICE OF INTENT	No. 39157
Today's Date: 11-28-16 Inten	ded Start Date: 12-2-16	140. 39131
Today's Date.	ded Start Date.	Well ID (if applicable): CTwm-ol
Type of Work to be Done: Drilling: Deepening:	Reconditioning: Plugging:	
Is this a replacement well? Yes No	If there is an existing well, what is the	e well log number?
Proposed use of well: Monitor	Diameter of well: 2 inches	umber of wells:
If this well is a domestic well, is it located within a water purveyor	or's service area? Yes 🗆 No 🗀 If	yes, what is the DOM waiver:
If this is a monitor well required by another government agency,	what is the facility ID number?	S39 Agency: NDEP
If this well is being completed under a waiver, please provide the	e corresponding waiver number:	
If a water right is associated with this well, what is the permit nu		
Location of the well by Public Land Survey:	4 SE 1/4 Sec. 12	T 22 NS R 62 E
Latitude: 36° 02' 48.97'N	UTM E	□ NAD 27
Longitude: 115°00, 06.66"W or	UTM N	
Address at well location: 510 S. For H	n St Henderson NV	89105
Assessor Parcel Number: 178-12-	701-004	
county: Clark	Subdivision Name:	
County.		trust
Address of official	or Suite 1550 Ch	icago IL 60601
Contractor's License Number: 00735355	On-Site Driller's License Number:	2512
Company Name and Address: Notion FWF	4221 oguenda Rd. Las	Vegas N 99118
Need Log Forms		Bell
(Rev. 1-14)	Driller's Signature:	000/

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT TO PLUG A MONITORING WELL

	Notice of Intent # 39157		
I,	Jay A. Sten beg Ches.	_Name & Title	
	Nevada Environmental Response Trust	_Company	
	35 E. Wacker Drive, Suite 1550	Address	
	Chicago, IL 60601		
	(702) 686-9611	_Telephone Number	DCNR/DWR/SNBO
of th	e real property located at:		NOV 2 8 2016
Stree	et Address (if any) 510 S. Fourth Street, Hen	derson, NV 89015	
Cou	nty Assessor Parcel Number (APN) 178-12-7	701-004	
Situa	nted within the <u>NW</u> ½ <u>SE</u> ½ Sec	tion 12 T 22 S R 6	62 E, M.D.B. & M.
_	Latitude (N): See attached or U U whereupon one or more monitoring wells are		Datum NAD83/WGS84 derstand that I shall
be re	esponsible for, and shall cause the wells to be	plugged in accordance with the p	provisions contained
in N	Jevada Administrative Code (NAC) 534.436	55 and all other applicable rules	and regulations for
drill	ing/plugging wells in the State of Nevada,	not later than thirty days af	ter the date when
mon	itoring is no longer required.		
I sha	all further make any purchaser of this parcel av	ware of these conditions.	
(Prin	nted Name): Jay A Geh Geh TLUMA's	(Signature):	Cre.
·Cou	nty of KANE		
Sub	scribed and sworn to before me on 11/25/2	1016	
by _	STEVEN & SCHROEDER	"OFFICIAL STEVEN R. SO Notary Public - S My Commission Expire	CHROEDER tate of Illinois s January 13, 2019

Signature of Notary Public Required

Notary Seal

Additional Well Locations

Coordinate system _ Lat/Long Datum NAD27

											CTIW-01D	C11W=013	CIW OL	CTW/_02	Well ID/Name
											36° 02' 48.03' N	204 001 40 (511)	36* 02' 48.70"N	36*02'49.18"N	C
											115 00 0000	115* 00' 05 35"W	115* 00' 05.69"W	115*00'05.65"W	Coordinates
												WW	WN	WW	1/4
												SE	SE	SE	1/4
		K	200									12	12	12	Sec.
		NOV 2 8 2016	RECEIVED									22S	22S	22S	Twn
		16	6									62E	62E	62E	Rng
												178-12-701-004	178-12-701-004	178-12-701-004	APN

Chemical Reduction Study

BRIAN SANDOVAL GOVERNOR

LEO DROZDOFF
Director

JASON KING, P.E. State Engineer



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 · Fax (702) 486-2781 http://water.nv.gov

NOTICE OF INTENT CARD REVIEW FORM

		10011011					
To:	Bob Nix		Date	July 13	, 2016		
	National EWP						
Facs	imile No.:	or E-mail Address:					
	This document was:	✓ E-mailed	Faxed	1			
NOI	Card Number: 37996	Appro	ved		Rejected	(See reason	ıs below)
	Work performed			missing		invalid	
	Proposed use of well			missing		invalid	
	Intended start date			missing		invalid	
	Waiver/Permit number if applicable	3		missing		invalid	
	Well location (legal description, Gl	PS coordinates)		missing		invalid	
	Parcel number			missing		invalid	
	Address at well location			missing		invalid	
	Permit number			missing		invalid	
	Waiver number or NDEP Facility I	D Number		missing		invalid	
	Address of Client			missing		invalid	
	Name of client/owner			missing		invalid	
	Contractor's license number			missing		invalid	
	Onsite well driller's license number	•		missing		invalid	
	Drilling company name/address			missing		invalid	
	Driller's signature			missing		invalid	
	Replacement well			Yes		No	
	If yes, existing well must be pursuant to NAC 534.300		e replace	ment well	l is drille	d,	
Inst	ructions: Please note that you must monitor wells within 30 c						

give our office a call.

Date reviewed: July 12, 2016

Person reviewing NOI Card: Christi Cooper, waiver completed by Tracy Geter.

STATE OF NEVADA

BRIAN SANDOVAL Governor

LEO DROZDOFF
Director



JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.

Supervising Engineer

DIVISION OF WATER RESOURCES SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 • Fax (702) 486-2781 http://water.nv.gov

July 13, 2016

MO-3195

Bob Nix Operations Manager National EWP 4221 W. Oquendo Road Las Vegas, Nevada 89118

RE: Request for waiver to install eight (8) temporary monitor wells to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number H-000539, located just southwest of 510 South Fourth Street, Henderson, Nevada and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install eight (8) temporary monitor wells to assess water conditions as described in your request received July 7, 2016. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on July 7, 2016.

The eight (8) proposed monitor wells referenced in your letter are listed below:

Well Name	Legal Description	GPS Coordinates (NAD 83/WGS 84)
I-AS	NE¼, SW¼ Section 12, T.22S, R62E	36.04733° N, -115.00433° W
I-AT	NE4, SW4 Section 12, T.22S, R62E	36.04793° N, -115.00432° W
I-AU	NE4, SW4 Section 12, T.22S, R62E	36.04793° N, -115.00412° W
I-AV	NE4, SW4 Section 12, T.22S, R62E	36.04747° N, -115.00440° W
I-AW	NE4, SW4 Section 12, T.22S, R62E	36.04747° N, -115.00431° W
I-AX	NE4, SW4 Section 12, T.22S, R62E	36.04747° N, -115.00423° W
I-AY	NE4, SW4 Section 12, T.22S, R62E	36.04747° N, -115.00415° W
I-AZ	NE¼, SW¼ Section 12, T.22S, R62E	36.04746° N, -115.00406° W

This office waives regulation NAC 534.4355(3) - "Monitor Wells: Casing; prevention of contamination: The diameter of the casing must not exceed 4 inches in nominal size."

You will be required to provide for a maximum of six (6) inch nominal diameter steel casing that complies with NAC 534.360 (3)(c) or PVC casing that complies with NAC 534.362 inclusive.

This office also waives the provisions that require a mandate to install monitoring wells, NAC § 534.4351 (1)(c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number H-000539, located just southwest of 510 South Fourth Street, Henderson, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then these wells must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3195.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact Mr. Nicholas Brothers at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 178-12-301-005 is shown as Nevada Environmental Response Trust by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between Nevada Environmental Response Trust and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter

Drilling Supervisor

cc: File

Carson City Office

Christi Cooper, SNBO Office

Nevada Environmental Response Trust, Property Owner, Chicago, IL

Nicholas Brothers, NDEP-Permits Group, Carson City, Nevada

BRIAN SANDOVAL GOVERNOR

Date reviewed: July 12, 2016

LEO DROZDOFF
Director

JASON KING, P.E. State Engineer



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 · Fax (702) 486-2781 http://water.nv.gov

NOTICE OF INTENT CARD REVIEW FORM

To:	Bob Nix		Date:	July 13	, 2016		
	National EWP	<u></u>					
Facs	mile No.:	or E-mail Address:					
	This document was:	✓E-mailed	Faxed				
NOI	Card Number: 37995	Approv	⁄ed	□F	Rejected (See reason	s below)
	Work performed		n	nissing		invalid	
	Proposed use of well		n	nissing		invalid	
	Intended start date		n	nissing		invalid	
	Waiver/Permit number if applicable	e	n	nissing		invalid	
	Well location (legal description, Gl	PS coordinates)	n	nissing		invalid	
	Parcel number		n	nissing		invalid	
	Address at well location		r	nissing		invalid	
	Permit number		r	nissing		invalid	
	Waiver number or NDEP Facility I	D Number	r	nissing		invalid	
	Address of Client		r	nissing		invalid	
	Name of client/owner		r	nissing		invalid	
	Contractor's license number		т	nissing		invalid	
	Onsite well driller's license number	r	r	nissing		invalid	
	Drilling company name/address		r	nissing		invalid	
	Driller's signature		I	nissing		invalid	
	Replacement well		7	Yes		No	
	If yes, existing well must be pursuant to NAC 534.300		e replacem	ent well	is drilled,	ł	
Inst	ructions: Please note that you must monitor wells within 30 of give our office a call.						
Pers	on reviewing NOI Card: Christi Co	oper, waiver complete	d by Tracy	Geter.			

BRIAN SANDOVAL Governor

LEO DROZDOFF



JASON KING, P.E. State Engineer

JOHN GUILLORY, P.E. Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201 Las Vegas, Nevada 89106 (702) 486-2770 • Fax (702) 486-2781 http://water.nv.gov

July 13, 2016

MO-3196

Bob Nix Operations Manager National EWP 4221 W. Oquendo Road Las Vegas, Nevada 89118

RE: Request for waiver to install thirty-seven (37) temporary monitor wells to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number H-000539, located just southwest of 510 South Fourth Street, Henderson, Nevada and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install thirty-seven (37) temporary monitor wells to assess water conditions as described in your request received July 7, 2016. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on July 7, 2016.

The thirty-seven (37) proposed monitor wells referenced in your letter are listed below:

Well Name	Legal Description	GPS Coordinates (NAD 83/WGS 84)
UFIW-05I	NE¼, SW¼ Section 12, T.22S, R62E	36.04733° N, -115.00432° W
UFIW-05D	NE¼, SW¼ Section 12, T.22S, R62E	36.04732° N, -115.00432° W
UFIW-06S	NE¼, SW¼ Section 12, T.22S, R62E	36.04733° N, -115.00427° W

Well Name	Legal Description	GPS Coordinates (NAD 83/WGS 84)
UFIW-06I	NE¼, SW¼ Section 12, T.22S, R62E	36.04732° N, -115.00426° W
UFIW-06D	NE14, SW14 Section 12, T.22S, R62E	36.04732° N, -115.00426° W
UFIW-07S	NE4, SW4 Section 12, T.22S, R62E	36.04733° N, -115.00421° W
UFIW-07I	NE¼, SW¼ Section 12, T.22S, R62E	36.04733° N, -115.00419° W
UFIW-07D	NE¼, SW¼ Section 12, T.22S, R62E	36.04732° N, -115.00420° W
UFIW-08S	NE¼, SW¼ Section 12, T.22S, R62E	36.04733°N, -115.00415°W
UFIW-08I	NE¼, SW¼ Section 12, T.22S, R62E	36.04733°N, -115.00413°W
UFIW-08D	NE¼, SW¼ Section 12, T.22S, R62E	36.04732° N, -115.00414° W
UFIW-01S	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00433° W
UFIW-01I	NE4, SW4 Section 12, T.22S, R62E	36.04783° N, -115.00431° W
UFIW-01D	NE¼, SW¼ Section 12, T.22S, R62E	36.04781°N, -115.00432°W
UFIW-02S	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00426° W
UFIW-02I	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00425° W
UFIW-02D	NE4, SW4 Section 12, T.22S, R62E	36.04781° N, -115.00426° W
UFIW-03S	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00420° W
UFIW-03I	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00419° W
UFIW-03D	NE¼, SW¼ Section 12, T.22S, R62E	36.04781° N, -115.00420° W
UFIW-04S	NE¼, SW¼ Section 12, T.22S, R62E	36.04782° N, -115.00414° W
UFIW-041	NE14, SW14 Section 12, T.22S, R62E	36.04782° N, -115.00413° W
UFIW-04D	NE¼, SW¼ Section 12, T.22S, R62E	36.04781° N, -115.00414° W
DFPZ-01	NE¼, SW¼ Section 12, T.22S, R62E	36.04793° N, -115.00436° W
DFPZ-02	NE¼, SW¼ Section 12, T.22S, R62E	36.04793° N, -115.00426° W

Well Name	Legal Description	GPS Coordinates (NAD 83/WGS 84)
DFPZ-03	NE¼, SW¼ Section 12, T.22S, R62E	36.04793° N, -115.00416° W
DFPZ-04	NE¼, SW¼ Section 12, T.22S, R62E	36.04747° N, -115.00436° W
DFPZ-05	NE¼, SW¼ Section 12, T.22S, R62E	36.04747° N, -115.00427° W
DFPZ-06	NE'4, SW'4 Section 12, T.22S, R62E	36.04747° N, -115.00419° W
DFPZ-07	NE¼, SW¼ Section 12, T.22S, R62E	36.04747° N, -115.00410° W
UFMW-01S	NE¼, SW¼ Section 12, T.22S, R62E	36.04788° N, -115.00432° W
UFMW-02S	NE¼, SW¼ Section 12, T.22S, R62E	36.04788° N, -115.00424° W
UFMW-03S	NE¼, SW¼ Section 12, T.22S, R62E	36.04788° N, -115.00417° W
UFMW-04S	NE¼, SW¼ Section 12, T.22S, R62E	36.04740° N, -115.00433° W
UFMW-05S	NE4, SW4 Section 12, T.22S, R62E	36.04740° N, -115.00423° W
UFMW-06S	NE4, SW4 Section 12, T.22S, R62E	36.04740° N, -115.00413° W

This office also waives the provisions that require a mandate to install monitoring wells, NAC § 534.4351 (1)(c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number H-000539, located just southwest of 510 South Fourth Street, Henderson, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then these wells must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3196.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

National EWP MO-3196 July 13, 2016 Page 4

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact Mr. Nicholas Brothers at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 178-12-301-005 is shown as Nevada Environmental Response Trust by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between Nevada Environmental Response Trust and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter

Drilling Supervisor

File cc:

Carson City Office

Christi Cooper, SNBO Office

Nevada Environmental Response Trust, Property Owner, Chicago, IL

Nicholas Brothers, NDEP-Permits Group, Carson City, Nevada

Appendix G Summary Data Tables

Biological Reduction Study

Central Retention Basin

			Sample Date	Solids Content N (%)	t Moisture Content (% Weight)	Der	sity	Porosity (%Vb)		Total Pore Fluid	Vertical 25 PSI Confining Stress		Horizontal 25 PSI Confining Stress		
Boring Location	Sample Depth (ft bgs)	Sample ID				Dry Bulk (g/cc)	Grain (g/cc)	Total	Air-Filled	Saturations (%Pv)	Effective Permeability to Water (millidarcy)	Hydraulic Conductivity (cm/s)	Effective Permeability to Water (millidarcy)	Hydraulic Conductivity (cm/s)	Intrinsic Permeability to Water (cm)
CTIW-01S	21.3	CTIW-01S-21.0-20161201	12/01/16	83.1	16.9	1.67	2.58	35.3	7.10	79.8	18.7	1.91E-05	92.8	9.21E-05	9.16E-10
CTIW-01D	35.3	CTIW-01D-35.0-20161129	11/29/16	45.6	54.4	0.99	2.66	62.8	8.90	85.9	10.2	1.04E-05	14.6	1.43E-05	1.45E-10
CTIW-02S	21.9	CTIW-02S-21.5-20170327	03/27/17	58.4	41.6	1.10	2.61	58.0	12.3	78.7	94.0	9.51E-05	74.5	7.40E-05	7.36E-10
CTIW-02D	41.6	CTIW-02D-41.5-20170324	03/24/17	43.8	56.2	0.96	2.62	63.3	9.2	85.5	0.65	6.61E-07	4.10	4.08E-06	4.04E-11
CTIW-03S	21.6	CTIW-03S-21.5-20170327	03/27/17	80.9	19.1	1.34	2.63	48.8	23.1	52.7	356	3.59E-04	712	7.01E-04	7.03E-09
CTIW-03D	41.1	CTIW-03D-41.0-20170327	03/27/17	50.0	50.0	1.07	2.63	59.3	5.8	90.2	0.89	9.09E-07	4.12	4.06E-06	4.07E-11
CTMW-01S	21.6	CTMW-01S-21.5-20170321	03/21/17	67.0	33.0	1.01	2.63	61.5	28.1	54.3	243	2.46E-04	387	3.83E-04	3.82E-09
CTMW-01D	43.1	CTMW-01D-43.0-20170321	03/21/17	50.2	49.8	1.02	2.64	61.2	10.1	83.4	0.75	7.64E-07	4.05	4.02E-06	3.99E-11
CTMW-02S	21.6	CTMW-02S-21.5-20170323	03/23/17	86.7	13.3	1.56	2.63	40.7	20.0	51.0	113	1.15E-04	733	7.34E-04	7.23E-09
CTMW-02D	41.6	CTMW-02D-41.5-20170323	03/23/17	46.6	53.4	1.02	2.62	60.9	6.1	89.9	1.05	1.07E-06	7.76	7.75E-06	7.66E-11
CTMW-03S	20.3	CTMW-03S-20.0-20161130	11/30/16	71.6	28.4	1.21	2.53	52.1	17.7	66.0	179	1.82E-04	268	2.64E-04	2.65E-09
CTMW-03D	35.3	CTMW-03D-35.0-20161130	11/30/16	62.8	37.2	1.29	2.63	51.0	3.10	93.9	2.28	2.33E-06	9.19	9.11E-06	9.08E-11
CTMW-04S	21.6	CTMW-04S-21.5-20170322	03/22/17	89.6	10.4	1.54	2.64	41.6	25.5	38.6	822	8.31E-04	391	3.91E-04	3.86E-09
CTMW-04D	41.6	CTMW-04D-41.5-20170322	03/22/17	41.5	58.5	0.98	2.62	62.6	5.3	91.5	0.59	6.02E-07	3.55	3.54E-06	3.50E-11
CTMW-05S	21.5	CTMW-05S-21.5-20170605	06/05/17	86.9	13.1	1.38	2.64	47.9	29.8	37.7	750	7.43E-04	1450	1.46E-03	1.43E-08
CTMW-05D	45.0	CTMW-05D-45.0-20170605	06/05/17	31.1	68.9	0.84	2.54	66.8	8.7	87.0	5.99	5.98E-06	6.21	6.25E-06	6.13E-11
CTMW-06S	21.5	CTMW-06S-21.5-20170606	06/06/17	89.4	10.6	1.52	2.62	41.8	25.6	38.7	300	3.00E-04	71.7	7.16E-05	7.07E-10
CTMW-06D	45.0	CTMW-06D-45.0-20170606	06/06/17	46.8	53.2	0.98	2.65	63.0	10.9	82.7	8.46	8.49E-06	4.35	4.37E-06	4.29E-11

Notes:

%Vb Percentage bulk volume %Pv Percentage pore volume

% weight Percentage weight

Air Filled Pore channels not occupied by pore fluids

cm/s Centimeters per second
g/cc Grams per cubic centimeter
ft bgs Feet below ground surface

Total Porosity All interconnected pore channels



Central Retention Basin

Central Neterition Basin														
Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Chlorate by USEPA Method 300.1B	Perchlorate by USEPA Method 314.0	Hexavalent Chromium by USEPA Method	Total Chromium by USEPA Method 6010B	Anio	ns by USEPA Method (mg/L)	300.0			SEPA Method 6010B g/L)	
	(it bys)			(ug/kg)	(ug/kg)	7199 (ug/kg)	(ug/kg)	Chloride	Nitrate as NO3	Sulfate	Calcium	Magnesium	Potassium	Sodium
OT!!!! 040	21.0	CTIW-01S-21.0-20161201	12/01/16	-	35,000	730	22,000							
CTIW-01S	21.0	CTIW-01S-21.0-20161201-FD	12/01/16	_	58,000	980	27,000							-
	0.5	CTIW-01D-0.5-20161128	11/28/16	_	1,500,000	190 J	22,000							
	5.0	CTIW-01D-5.0-20161128	11/28/16	-	43,000	<160	19,000							-
	10.0	CTIW-01D-10.0-20161128	11/28/16	-	17,000	<170	16,000							-
	15.0	CTIW-01D-15.0-20161128	11/28/16	_	350,000	<160	11,000							
	20.0	CTIW-01D-20.0-20161128	11/28/16	_	140,000	<180	36,000							
	25.0	CTIW-01D-25.0-20161129	11/29/16	_	380,000	8,400	36,000			-				-
	25.0	CTIW-01D-25.0-20161129-FD	11/29/16	_	400,000	12,000	42,000							_
CTIW-01D	30.0	CTIW-01D-30.0-20161129	11/29/16	_	400,000	11,000	54,000							
	35.0	CTIW-01D-35.0-20161129	11/29/16	_	720,000	10,000	31,000							
	40.0	CTIW-01D-40.0-20161129	11/29/16	_	1,400,000	19,000	48,000	_		-				_
	45.0	CTIW-01D-45.0-20161129	11/29/16	_	970,000	20,000	47,000							-
	50.0	CTIW-01D-50.0-20161129	11/29/16	_	520,000	16,000	40,000							
	55.0	CTIW-01D-55.0-20161129	11/29/16	_	610,000	6,900	29,000							
	60.0	CTIW-01D-60.0-20161129	11/29/16	_	120,000	650	30,000							
CTIW-02S	22.0	CTIW-02S-22.0-20170327	03/27/17	380,000	73,000	1,500	29,000	110	360	280	5.3 B	3.5 B	3.4 J	200
C11W-020	0.5	CTIW-02D-0.5-20170320	03/20/17	9,800	660,000	<160	21,000				5.5 B	5.5 B	5.40	
	5.0	CTIW-02D-5.0-20170324	03/24/17	17,000	350,000	200 J	20,000							
	10.0	CTIW-02D-3.0-20170324	03/24/17	980 F1	18,000	<180	15,000							
	15.0	CTIW-02D-10.0-20170324 CTIW-02D-15.0-20170324	03/24/17	750	120,000	<160	15,000							
	15.0	CTIW-02D-15.0-20170324-FD	03/24/17	950	65,000	<180	18,000				1	-		
	-	CTIW-02D-13.0-20170324-FD	03/24/17	11,000	530,000	<200	1							
CTIW-02D	20.0	CTIW-02D-25.0-20170324	03/24/17	1,800,000	240,000	7,700	31,000							
	-						49,000					+		
	30.0	CTIW-02D-30.0-20170324	03/24/17	2,400,000	290,000	8,300	50,000							
	35.0	CTIW-02D-35.0-20170324	03/24/17	1,900,000	390,000	8,900	32,000							
	40.0	CTIW-02D-40.0-20170324	03/24/17	3,200,000	820,000	12,000	51,000							-
	45.0	CTIW-02D-45.0-20170324	03/24/17	3,600,000	890,000	13,000	48,000							
	50.0	CTIW-02D-50.0-20170324	03/24/17	1,900,000	520,000	6,700	20,000							
CTIW-03S	22.0	CTIW-03S-22.0-20170327	03/27/17	10,000	80,000	220 J	35,000	100	330	210	16 B	17 B	3.1 J	98
	0.5	CTIW-03D-0.5-20170320	03/20/17	24,000	140,000	370	24,000							-
	5.0	CTIW-03D-5.0-20170327	03/27/17	3,000	350,000	160 J	24,000		-		-			-
	10.0	CTIW-03D-10.0-20170327	03/27/17	22,000	72,000	<160	17,000							-
	10.0	CTIW-03D-10.0-20170327-FD	03/27/17	21,000	40,000	<160	18,000		-		-			-
	15.0	CTIW-03D-15.0-20170327	03/27/17	8,800	11,000	<160	13,000	-	-	-	-			-
	20.0	CTIW03-20.0-20170327	03/27/17	18,000	150,000	<190	26,000		-		-			-
CTIW-03D	25.0	CTIW03-25.0-20170327	03/27/17	1,200,000	200,000	6,400	42,000							
	25.0	CTIW03-25.0-20170327-FD	03/27/17	1,000,000	140,000	4,700	25,000							
	30.0	CTIW03-30.0-20170327	03/27/17	2,300,000	370,000	11,000	55,000							
	35.0	CTIW03-35.0-20170327	03/27/17	2,900,000	560,000	12,000	44,000							-
	40.0	CTIW03-40.0-20170327	03/27/17	3,300,000	930,000	16,000	52,000							-
	41.5	CTIW03-41.5-20170327	03/27/17	3,100,000	790,000	12,000	41,000	480	32	530	34 B	19 B	5.8	200
	45.0	CTIW03-45.0-20170327	03/27/17	2,400,000	1,100,000	17,000	50,000							-
	50.0	CTIW03-50.0-20170327	03/27/17	1,500,000	1,000,000	9,000	40,000							

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface
mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Chlorate by USEPA Method 300.1B (ug/kg)	Perchlorate by USEPA Method 314.0 (ug/kg)	Hexavalent Chromium by USEPA Method 7199 (ug/kg)	Total Chromium by USEPA Method 6010B (ug/kg)	Anio Chloride	ns by USEPA Method (mg/L) Nitrate as NO3	300.0 Sulfate	Calcium	JSEPA Method 6010B g/L) Potassium	Sodium
	0.5	CTMW-01D-0.5-20170320	03/20/17	200 J	6,700	<170	21,000			-		 	
	5.0	CTMW-01D-5.0-20170321	03/21/17	1,200	160,000	<170	57,000			-		 	-
	10.0	CTMW-01D-10.0-20170321	03/21/17	3,500	190,000	<160	22,000			-		 	
	15.0	CTMW-01D-15.0-20170321	03/21/17	7,500	520,000	<160	13,000					 	
	20.0	CTMW-01D-20.0-20170321	03/21/17	2,300,000	230,000	1,800	37,000					 	
	25.0	CTMW-01D-25.0-20170321	03/21/17	1,100,000	140,000	4,800	25,000					 	
CTMW-01D	30.0	CTMW-01D-30.0-20170321	03/21/17	2,200,000	420,000	11,000	43,000					 	
CTIVIVV-01D	35.0	CTMW-01D-35.0-20170321	03/21/17	2,200,000	520,000	9,400	81,000					 	
	40.0	CTMW-01D-40.0-20170321	03/21/17	2,600,000	580,000	13,000	39,000					 	
	45.0	CTMW-01D-45.0-20170321	03/21/17	2,700,000	730,000	13,000	38,000					 	
	50.0	CTMW-01D-50.0-20170321	03/21/17	3,100,000	550,000	13,000	35,000					 	
	55.0	CTMW-01D-55.0-20170321	03/21/17	3,000,000	690,000	11,000	34,000					 	
	55.0	CTMW-01D-55.0-20170321-FD	03/21/17	2,800,000	570,000	9,700	31,000					 	
	60.0	CTMW-01D-60.0-20170321	03/21/17	3,200,000	930,000	10,000	40,000	-				 	
	0.5	CTMW-02D-0.5-20170320	03/20/17	<57	2,800	240 J F1	21,000					 	
	5.0	CTMW-02D-5.0-20170323	03/23/17	26,000	420,000	<160	20,000					 	
	10.0	CTMW-02D-10.0-20170323	03/23/17	5,700	49,000	<160	18,000					 	
	10.0	CTMW-02D-10.0-20170323-FD	03/23/17	5,600	68,000	<160	17,000					 	
	15.0	CTMW-02D-15.0-20170323	03/23/17	7,600	22,000	<160	16,000					 	
	20.0	CTMW-02D-20.0-20170323	03/23/17	31,000	110,000	<180	17,000					 	
071111 000	25.0	CTMW-02D-25.0-20170323	03/23/17	2,200,000	280,000	8,800	59,000					 	
CTMW-02D	30.0	CTMW-02D-30.0-20170323	03/23/17	1,600,000	230,000	6,000	51,000					 	
	35.0	CTMW-02D-35.0-20170323	03/23/17	2,300,000	580,000	8,200	34,000					 	
	40.0	CTMW-02D-40.0-20170323	03/23/17	2,900,000	840,000	14,000	45,000					 	
	45.0	CTMW-02D-45.0-20170323	03/23/17	2,400,000	610,000	12,000	46,000					 	
	50.0	CTMW-02D-50.0-20170323	03/23/17	2,100,000	740,000	9,800	38,000					 	
	55.0	CTMW-02D-55.0-20170323	03/23/17	3,700,000	1,100,000	22,000	49,000					 	
	60.0	CTMW-02D-60.0-20170323	03/23/17	4,000,000	1,200,000	14,000	53,000					 	
	0.5	CTMW-03-0.5-20161130	11/30/16	_	700 F1	<160	29,000					 	
	5.0	CTMW-03-5.0-20161130	11/30/16	_	1,800,000	<170	28,000					 	
	10.0	CTMW-03-10.0-20161130	11/30/16	_	420,000	<160	17,000					 	
	15.0	CTMW-03-15.0-20161130	11/30/16	_	260,000	<160	24,000					 	
	20.0	CTMW-03-20.0-20161130	11/30/16	_	580,000	1,400	44,000					 	
	25.0	CTMW-03-25.0-20161130	11/30/16	_	87,000	1,700	17,000					 	
	30.0	CTMW-03-30.0-20161130	11/30/16	_	410,000	9,500	54,000					 	
CTMW-03D	30.0	CTMW-03-30.0-20161130-FD	11/30/16	_	380,000	11,000	67,000					 	
	35.0	CTMW-03-35.0-20161130	11/30/16	_	290,000	6,200	32,000	_				 	
	40.0	CTMW-03-40.0-20161201	12/01/16	_	1,100,000	13,000	42,000	_				 	
	45.0	CTMW-03-45.0-20161201	12/01/16	_	1,100,000	17,000	41,000	_				 	
	50.0	CTMW-03-50.0-20161201	12/01/16	_	650,000	13,000	32,000					 	
	55.0	CTMW-03-55.0-20161201	12/01/16	_	430,000	9,200 F2	23,000					 	
			, , , , ,		, 0 0 0	-,	,000				1	 	

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface

mg/kg Milligram per kilogram

Concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

								_						
Boring Location	Sample Depth (ft bgs)	Sample ID Si	Sample Date	Chlorate by USEPA Method 300.1B (ug/kg)	Perchlorate by USEPA Method 314.0 (ug/kg)	Hexavalent Chromium by USEPA Method 7199 (ug/kg)	Total Chromium by USEPA Method 6010B (ug/kg)	Anio Chloride	ns by USEPA Method (mg/L) Nitrate as NO3	300.0 Sulfate	Calcium		SEPA Method 6010B g/L) Potassium	Sodium
	0.5	CTMW-04D-0 5-20170320	03/20/17	740	32.000	220 J	23.000							
	5.0	CTMW-04D-5.0-20170322	03/22/17	3,200 F1	340,000	<160	16,000							
	10.0	CTMW-04D-10.0-20170322	03/22/17	4,600	1,800,000	260 J	14,000							_
	15.0	CTMW-04D-15.0-20170322	03/22/17	4,800	3,000,000	200 J	17,000							
	20.0	CTMW-04D-20.0-20170322	03/22/17	9,800	3,300,000	<160	14,000							
	25.0	CTMW-04D-25.0-20170322	03/22/17	1,600,000	240,000	8,100	44,000							
CTMW-04D	25.0	CTMW-04D-25.0-20170322-FD	03/22/17	1,600,000	250,000	6,200	43,000			-				-
CTMW-04D	30.0	CTMW-04D-30.0-20170322	03/22/17	2,000,000	320,000	9,600	73,000			-				
	35.0	CTMW-04D-35.0-20170322	03/22/17	2,100,000	470,000	11,000	44,000							
	40.0	CTMW-04D-40.0-20170322	03/22/17	2,400,000	700,000	11,000	42,000							
	45.0	CTMW-04D-45.0-20170322	03/22/17	3,600,000	890,000	16,000	53,000			-				-
	50.0	CTMW-04D-50.0-20170322	03/22/17	2,300,000	440,000	8,100	26,000	-						-
	55.0	CTMW-04D-55.0-20170322	03/22/17	2,900,000	830,000	11,000	38,000							
	60.0	CTMW-04D-60.0-20170322	03/22/17	2,800,000	750,000	10,000	27,000							-
	0.5	CTMW-05D-0.5-20170605	06/05/17	340	1,600 F1	920	14,000							
	5.0	CTMW-05D-5.0-20170605	06/05/17	<550	3,900	230 J	20,000							-
	10.0	CTMW-05D-10.0-20170605	06/05/17	1,700	310,000	<180	11,000			-				
	15.0	CTMW-05D-15.0-20170605	06/05/17	3,900	940,000	<160	17,000			-				
	15.0	CTMW-05D-15.0-20170605-FD	06/05/17	4,200	310,000	<170	17,000							
	20.0	CTMW-05D-20.0-20170605	06/05/17	270,000	4,900,000	8,000	51,000	120	44	49	52 B	14	17	310
CTMW-05D	25.0	CTMW-05D-25.0-20170605	06/05/17	1,400,000	330,000	2,300	36,000					-		-
	30.0	CTMW-05D-30.0-20170605	06/05/17	1,800,000	340,000	4,500	40,000	-		-				
	35.0	CTMW-05D-35.0-20170605	06/05/17	2,300,000	330,000	2,700	42,000							
	40.0	CTMW-05D-40.0-20170605	06/05/17	1,300,000	250,000	4,800	36,000							
	45.0 50.0	CTMW-05D-45.0-20170605	06/05/17	2,600,000	1,000,000	10,000 7.600	51,000	60	4.0	64	17 B	7.6	6.9	260
	55.0	CTMW-05D-50.0-20170605 CTMW-05D-55.0-20170605	06/05/17	2,200,000 1,300,000	650,000	, , , , ,	39,000							
	60.0	CTMW-05D-60.0-20170605	06/05/17 06/05/17	2,900,000	450,000 940.000	5,500 1.600	26,000 46.000							
	0.5	CTMW-06D-0.5-20170606	06/06/17	2,900,000 2.800 F1	2,500	<160	18.000							
	5.0	CTMW-06D-0.5-20170606 CTMW-06D-5.0-20170606	06/06/17	3,800	520,000	<160	15,000							
	10.0	CTMW-06D-10.0-20170606	06/06/17	9,300	3.700.000	<160	14.000							
	10.0	CTMW-06D-10.0-20170606-FD	06/06/17	9,400	3,800,000	<160	12,000							
	15.0	CTMW-06D-15.0-20170606	06/06/17	9,000	3,400,000	<160	25,000							
	20.0	CTMW-06D-20.0-20170606	06/06/17	63,000	3,000,000	<180	58,000	110	31	38	25B	9.1	17	360
	25.0	CTMW-06D-25.0-20170606	06/06/17	980,000	500,000	<630	54,000							
CTMW-06D	30.0	CTMW-06D-30.0-20170606	06/06/17	1,400,000	340,000	1,700	44,000							
	35.0	CTMW-06D-35.0-20170606	06/06/17	1,300,000	210,000	2,900	45,000							
	40.0	CTMW-06D-40.0-20170606	06/06/17	760,000	450,000	5,400	50,000							
	43.5	CTMW-06D-43.5-20170606	06/06/17	2,300,000	750,000	2,800	51,000	44	4.1	60	19 B	8.2	6.3	260
	45.0	CTMW-06D-45.0-20170606	06/06/17	2,500,000	670,000	9,800	43,000							-
	50.0	CTMW-06D-50.0-20170606	06/06/17	2,000,000	740,000	9,000	51,000							-
	55.0	CTMW-06D-55.0-20170606	06/06/17	2,900,000	1,000,000	3,700	43,000		-	-				-

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface

Concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

		Sample ID Sa	Sample ID San							Dissolved	Metals by USEPA M (mg/kg)	ethod 6020					
Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc	
OTIM 040	21.0	CTIW-01S-21.0-20161201	12/01/16														
CTIW-01S	21.0	CTIW-01S-21.0-20161201-FD	12/01/16	-	-										-		
	0.5	CTIW-01D-0.5-20161128	11/28/16														
	5.0	CTIW-01D-5.0-20161128	11/28/16														
	10.0	CTIW-01D-10.0-20161128	11/28/16												-		
	15.0	CTIW-01D-15.0-20161128	11/28/16														
	20.0	CTIW-01D-20.0-20161128	11/28/16												-		
	25.0	CTIW-01D-25.0-20161129	11/29/16														
OTIL COLD	25.0	CTIW-01D-25.0-20161129-FD	11/29/16														
CTIW-01D	30.0	CTIW-01D-30.0-20161129	11/29/16														
	35.0	CTIW-01D-35.0-20161129	11/29/16														
	40.0	CTIW-01D-40.0-20161129	11/29/16														
	45.0	CTIW-01D-45.0-20161129	11/29/16	_											_		
	50.0	CTIW-01D-50.0-20161129	11/29/16	_											_		
	55.0	CTIW-01D-55.0-20161129	11/29/16														
	60.0	CTIW-01D-60.0-20161129	11/29/16														
CTIW-02S	22.0	CTIW-02S-22.0-20170327	03/27/17	22	26 F1	<0.96	25	3.1 J	7.4	4.2	<3.2	8.2	<1.3	<0.64	21	<32 F1	
01111 020	0.5	CTIW-02D-0.5-20170320	03/20/17														
	5.0	CTIW-02D-5.0-20170324	03/24/17														
	10.0	CTIW-02D-10.0-20170324	03/24/17														
	15.0	CTIW-02D-15.0-20170324	03/24/17				-				-						
	15.0	CTIW-02D-15.0-20170324-FD	03/24/17				-				-						
	20.0	CTIW-02D-13.0-20170324-1-D	03/24/17														
CTIW-02D	25.0	CTIW-02D-25.0-20170324	03/24/17														
	30.0	CTIW-02D-30.0-20170324	03/24/17														
	35.0		03/24/17												-		
	40.0	CTIW-02D-35.0-20170324	03/24/17														
		CTIW-02D-40.0-20170324															
	45.0	CTIW-02D-45.0-20170324	03/24/17														
07114 000	50.0	CTIW-02D-50.0-20170324	03/24/17														
CTIW-03S	22.0	CTIW-03S-22.0-20170327	03/27/17	22	140	<0.84	35	4.4	9.2	5.1	<2.8	11	<1.1	<0.56	37	<28	
	0.5	CTIW-03D-0.5-20170320	03/20/17														
	5.0	CTIW-03D-5.0-20170327	03/27/17														
	10.0	CTIW-03D-10.0-20170327	03/27/17														
	10.0	CTIW-03D-10.0-20170327-FD	03/27/17														
	15.0	CTIW-03D-15.0-20170327	03/27/17														
	20.0	CTIW03-20.0-20170327	03/27/17														
CTIW-03D	25.0	CTIW03-25.0-20170327	03/27/17												-		
	25.0	CTIW03-25.0-20170327-FD	03/27/17												-		
	30.0	CTIW03-30.0-20170327	03/27/17	-											-		
	35.0	CTIW03-35.0-20170327	03/27/17	-	-										-		
	40.0	CTIW03-40.0-20170327	03/27/17	-	-										-		
	41.5	CTIW03-41.5-20170327	03/27/17	17	85	<1.1	36	6.2	14	9.1	<3.6	14	<1.4	1.2 J	40	42 J	
	45.0	CTIW03-45.0-20170327	03/27/17														
	50.0	CTIW03-50.0-20170327	03/27/17														

Notes

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface

mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

				Contract Necestarian Bushin												
Boring Location	Sample Depth	Sample ID	Sample Date						Dissolved	Metals by USEPA M (mg/kg)	ethod 6020					
	(ft bgs)			Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc
	0.5	CTMW-01D-0.5-20170320	03/20/17													
	5.0	CTMW-01D-5.0-20170321	03/21/17											-		
	10.0	CTMW-01D-10.0-20170321	03/21/17											-		
	15.0	CTMW-01D-15.0-20170321	03/21/17	-	-										-	
	20.0	CTMW-01D-20.0-20170321	03/21/17	-	-									-	-	
	25.0	CTMW-01D-25.0-20170321	03/21/17	-												
CTMW-01D	30.0	CTMW-01D-30.0-20170321	03/21/17	-												
CTIVIVV-01D	35.0	CTMW-01D-35.0-20170321	03/21/17											1		
	40.0	CTMW-01D-40.0-20170321	03/21/17		-			-			-			ı		
	45.0	CTMW-01D-45.0-20170321	03/21/17													
	50.0	CTMW-01D-50.0-20170321	03/21/17					-						-		
	55.0	CTMW-01D-55.0-20170321	03/21/17					-						-		
	55.0	CTMW-01D-55.0-20170321-FD	03/21/17													
	60.0	CTMW-01D-60.0-20170321	03/21/17													
	0.5	CTMW-02D-0.5-20170320	03/20/17											-		
	5.0	CTMW-02D-5.0-20170323	03/23/17					-						-		
	10.0	CTMW-02D-10.0-20170323	03/23/17													
	10.0	CTMW-02D-10.0-20170323-FD	03/23/17													
	15.0	CTMW-02D-15.0-20170323	03/23/17													
	20.0	CTMW-02D-20.0-20170323	03/23/17												-	
CTMW-02D	25.0	CTMW-02D-25.0-20170323	03/23/17	-	-											
0111111 025	30.0	CTMW-02D-30.0-20170323	03/23/17													
	35.0	CTMW-02D-35.0-20170323	03/23/17	-	-											
	40.0	CTMW-02D-40.0-20170323	03/23/17													
	45.0	CTMW-02D-45.0-20170323	03/23/17													
	50.0	CTMW-02D-50.0-20170323	03/23/17											-		
	55.0	CTMW-02D-55.0-20170323	03/23/17											-		
	60.0	CTMW-02D-60.0-20170323	03/23/17													
	0.5	CTMW-03-0.5-20161130	11/30/16	-												
	5.0	CTMW-03-5.0-20161130	11/30/16													
	10.0	CTMW-03-10.0-20161130	11/30/16													
	15.0	CTMW-03-15.0-20161130	11/30/16													
	20.0	CTMW-03-20.0-20161130	11/30/16						-						-	
	25.0	CTMW-03-25.0-20161130	11/30/16													
CTMW-03D	30.0	CTMW-03-30.0-20161130	11/30/16	-												
	30.0	CTMW-03-30.0-20161130-FD	11/30/16	-												
	35.0	CTMW-03-35.0-20161130	11/30/16	-												
	40.0	CTMW-03-40.0-20161201	12/01/16	-												
	45.0	CTMW-03-45.0-20161201	12/01/16	-												
	50.0	CTMW-03-50.0-20161201	12/01/16	-							-			-		
	55.0	CTMW-03-55.0-20161201	12/01/16													
	60.0	CTMW-03-60.0-20161201	12/01/16	-												

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface
mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

Boring Location	Sample Depth	Sample ID	Sample Date						Dissolved	Metals by USEPA Me (mg/kg)	ethod 6020					
	(ft bgs)			Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Vanadium	Zinc
	0.5	CTMW-04D-0.5-20170320	03/20/17													
	5.0	CTMW-04D-5.0-20170322	03/22/17											-		
	10.0	CTMW-04D-10.0-20170322	03/22/17											-		
	15.0	CTMW-04D-15.0-20170322	03/22/17												-	
	20.0	CTMW-04D-20.0-20170322	03/22/17	-				-						-	-	
	25.0	CTMW-04D-25.0-20170322	03/22/17													
CTMW-04D	25.0	CTMW-04D-25.0-20170322-FD	03/22/17													
CTMW-04D	30.0	CTMW-04D-30.0-20170322	03/22/17	-								-		1		
	35.0	CTMW-04D-35.0-20170322	03/22/17	-										-		
	40.0	CTMW-04D-40.0-20170322	03/22/17													
	45.0	CTMW-04D-45.0-20170322	03/22/17													
	50.0	CTMW-04D-50.0-20170322	03/22/17									-		-		
	55.0	CTMW-04D-55.0-20170322	03/22/17													
	60.0	CTMW-04D-60.0-20170322	03/22/17											-		
	0.5	CTMW-05D-0.5-20170605	06/05/17	-	-			-				-		1		
	5.0	CTMW-05D-5.0-20170605	06/05/17											-		
	10.0	CTMW-05D-10.0-20170605	06/05/17													
	15.0	CTMW-05D-15.0-20170605	06/05/17													
	15.0	CTMW-05D-15.0-20170605-FD	06/05/17													
	20.0	CTMW-05D-20.0-20170605	06/05/17	32	230	0.41	46	3.4	8.7	3.9	<0.66	11	1.0 J	0.19 J	30	18
CTMW-05D	25.0	CTMW-05D-25.0-20170605	06/05/17													
01	30.0	CTMW-05D-30.0-20170605	06/05/17													
	35.0	CTMW-05D-35.0-20170605	06/05/17	-												
	40.0	CTMW-05D-40.0-20170605	06/05/17													
	45.0	CTMW-05D-45.0-20170605	06/05/17	22	39	1.2	44	7.3	16	9.9	1.9	16	1.1 J	<0.17	35	50
	50.0	CTMW-05D-50.0-20170605	06/05/17											-		
	55.0	CTMW-05D-55.0-20170605	06/05/17	-										1		
	60.0	CTMW-05D-60.0-20170605	06/05/17													
	0.5	CTMW-06D-0.5-20170606	06/06/17													
	5.0	CTMW-06D-5.0-20170606	06/06/17													
	10.0	CTMW-06D-10.0-20170606	06/06/17													
	10.0	CTMW-06D-10.0-20170606-FD	06/06/17													
	15.0	CTMW-06D-15.0-20170606	06/06/17													
	20.0	CTMW-06D-20.0-20170606	06/06/17	37	42	0.21 J	61	1.6	4.8	2.1	<0.59	6.3	0.50 J	<0.12	20	9.0 J
CTMW-06D	25.0	CTMW-06D-25.0-20170606	06/06/17	-												
	30.0	CTMW-06D-30.0-20170606	06/06/17						-		-				-	
	35.0	CTMW-06D-35.0-20170606	06/06/17	-												
	40.0	CTMW-06D-40.0-20170606	06/06/17	-												
	43.5	CTMW-06D-43.5-20170606	06/06/17	17	62	1.1	43	5.7	14	8.4	1.3 J	14	1.4 J	<0.16	32	39
	45.0	CTMW-06D-45.0-20170606	06/06/17	-										-		
	50.0	CTMW-06D-50.0-20170606	06/06/17	-												
	55.0	CTMW-06D-55.0-20170606	06/06/17	-												

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface
mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Mercury by USEPA Method 7471A (mg/kg)	Total Organic Carbon (mg/kg)	рН	Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Percent Solids	Moisture Content
CTIW-01S	21.0	CTIW-01S-21.0-20161201	12/01/16						88.6%	11.4%
01W-010	21.0	CTIW-01S-21.0-20161201-FD	12/01/16						78.6%	21.4%
	0.5	CTIW-01D-0.5-20161128	11/28/16				-		90.4%	9.6%
	5.0	CTIW-01D-5.0-20161128	11/28/16		-		-		92.2%	7.8%
	10.0	CTIW-01D-10.0-20161128	11/28/16						91.4%	8.6%
	15.0	CTIW-01D-15.0-20161128	11/28/16						93.9%	6.1%
	20.0	CTIW-01D-20.0-20161128	11/28/16						84.6%	15.4%
	25.0	CTIW-01D-25.0-20161129	11/29/16						55.9%	44.1%
CTIW-01D	25.0	CTIW-01D-25.0-20161129-FD	11/29/16				-		55.4%	44.6%
CTIVV-OTD	30.0	CTIW-01D-30.0-20161129	11/29/16						58.2%	41.8%
	35.0	CTIW-01D-35.0-20161129	11/29/16						63.2%	36.8%
	40.0	CTIW-01D-40.0-20161129	11/29/16						61.6%	38.4%
	45.0	CTIW-01D-45.0-20161129	11/29/16				-		58.7%	41.3%
	50.0	CTIW-01D-50.0-20161129	11/29/16						69.5%	30.5%
	55.0	CTIW-01D-55.0-20161129	11/29/16						71.2%	28.8%
	60.0	CTIW-01D-60.0-20161129	11/29/16				-		86.0%	14.0%
CTIW-02S	22.0	CTIW-02S-22.0-20170327	03/27/17	0.015 J	34,000	8.7	1,400	3,600	77.5%	22.5%
	0.5	CTIW-02D-0.5-20170320	03/20/17						91.4%	8.6%
	5.0	CTIW-02D-5.0-20170324	03/24/17						91.8%	8.2%
	10.0	CTIW-02D-10.0-20170324	03/24/17						84.4%	15.6%
	15.0	CTIW-02D-15.0-20170324	03/24/17						93.6%	6.4%
	15.0	CTIW-02D-15.0-20170324-FD	03/24/17						85.5%	14.5%
OT!!!! 00D	20.0	CTIW-02D-20.0-20170324	03/24/17						73.5%	26.5%
CTIW-02D	25.0	CTIW-02D-25.0-20170324	03/24/17						53.7%	46.3%
	30.0	CTIW-02D-30.0-20170324	03/24/17						60.5%	39.5%
	35.0	CTIW-02D-35.0-20170324	03/24/17						65.8%	34.2%
	40.0	CTIW-02D-40.0-20170324	03/24/17						61.4%	38.6%
	45.0	CTIW-02D-45.0-20170324	03/24/17						51.7%	48.3%
	50.0	CTIW-02D-50.0-20170324	03/24/17						75.1%	24.9%
CTIW-03S	22.0	CTIW-03S-22.0-20170327	03/27/17	<0.014	17,000	8.5	570	1,900	87.5%	12.5%
	0.5	CTIW-03D-0.5-20170320	03/20/17						87.6%	12.4%
	5.0	CTIW-03D-5.0-20170327	03/27/17						93.1%	6.9%
	10.0	CTIW-03D-10.0-20170327	03/27/17						92.3%	7.7%
	10.0	CTIW-03D-10.0-20170327-FD	03/27/17						93.6%	6.4%
	15.0	CTIW-03D-15.0-20170327	03/27/17						94.8%	5.2%
	20.0	CTIW03-20.0-20170327	03/27/17						82.0%	18.0%
07114/ 000	25.0	CTIW03-25.0-20170327	03/27/17						57.3%	42.7%
CTIW-03D	25.0	CTIW03-25.0-20170327-FD	03/27/17						66.5%	33.5%
	30.0	CTIW03-30.0-20170327	03/27/17						60.1%	39.9%
	35.0	CTIW03-35.0-20170327	03/27/17						58.0%	42.0%
	40.0	CTIW03-40.0-20170327	03/27/17						63.3%	36.7%
	41.5	CTIW03-41.5-20170327	03/27/17	<0.017	9,000	7.6	110	4,900	68.8%	31.2%
	45.0	CTIW03-45.0-20170327	03/27/17						60.5%	39.5%
	50.0	CTIW03-50.0-20170327	03/27/17						63.1%	36.9%

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Mercury by USEPA Method 7471A (mg/kg)	Total Organic Carbon (mg/kg)	рН	Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Percent Solids	Moisture Content
	0.5	CTMW-01D-0.5-20170320	03/20/17						88.6%	11.4%
	5.0	CTMW-01D-5.0-20170321	03/21/17						90.9%	9.1%
	10.0	CTMW-01D-10.0-20170321	03/21/17						91.8%	8.2%
	15.0	CTMW-01D-15.0-20170321	03/21/17						95.2%	4.8%
	20.0	CTMW-01D-20.0-20170321	03/21/17						76.0%	24.0%
	25.0	CTMW-01D-25.0-20170321	03/21/17		-				60.2%	39.8%
CTMW-01D	30.0	CTMW-01D-30.0-20170321	03/21/17						64.3%	35.7%
CTMWV-01D	35.0	CTMW-01D-35.0-20170321	03/21/17		-				62.9%	37.1%
	40.0	CTMW-01D-40.0-20170321	03/21/17		-				72.1%	27.9%
	45.0	CTMW-01D-45.0-20170321	03/21/17		-				65.2%	34.8%
	50.0	CTMW-01D-50.0-20170321	03/21/17		-				66.9%	33.1%
	55.0	CTMW-01D-55.0-20170321	03/21/17						63.2%	36.8%
	55.0	CTMW-01D-55.0-20170321-FD	03/21/17						69.9%	30.1%
	60.0	CTMW-01D-60.0-20170321	03/21/17						57.6%	42.4%
	0.5	CTMW-02D-0.5-20170320	03/20/17						88.0%	12.0%
	5.0	CTMW-02D-5.0-20170323	03/23/17						92.3%	7.7%
	10.0	CTMW-02D-10.0-20170323	03/23/17						93.8%	6.2%
	10.0	CTMW-02D-10.0-20170323-FD	03/23/17						92.2%	7.8%
	15.0	CTMW-02D-15.0-20170323	03/23/17						94.5%	5.5%
	20.0	CTMW-02D-20.0-20170323	03/23/17		-				84.6%	15.4%
CTMW-02D	25.0	CTMW-02D-25.0-20170323	03/23/17		-				50.9%	49.1%
0111111 025	30.0	CTMW-02D-30.0-20170323	03/23/17						62.0%	38.0%
	35.0	CTMW-02D-35.0-20170323	03/23/17		-				66.3%	33.7%
	40.0	CTMW-02D-40.0-20170323	03/23/17						63.5%	36.5%
	45.0	CTMW-02D-45.0-20170323	03/23/17						58.7%	41.3%
	50.0	CTMW-02D-50.0-20170323	03/23/17						69.8%	30.2%
	55.0	CTMW-02D-55.0-20170323	03/23/17						53.3%	46.7%
	60.0	CTMW-02D-60.0-20170323	03/23/17						64.3%	35.7%
	0.5	CTMW-03-0.5-20161130	11/30/16						95.0%	5.0%
	5.0	CTMW-03-5.0-20161130	11/30/16						89.8%	10.2%
	10.0	CTMW-03-10.0-20161130	11/30/16		-				93.6%	6.4%
	15.0	CTMW-03-15.0-20161130	11/30/16						92.1%	7.9%
	20.0	CTMW-03-20.0-20161130	11/30/16						84.2%	15.8%
	25.0	CTMW-03-25.0-20161130	11/30/16		-				87.5%	12.5%
CTMW-03D	30.0	CTMW-03-30.0-20161130	11/30/16						57.1%	42.9%
	30.0	CTMW-03-30.0-20161130-FD	11/30/16						55.8%	44.2%
	35.0	CTMW-03-35.0-20161130	11/30/16						67.4%	32.6%
	40.0	CTMW-03-40.0-20161201	12/01/16						66.4%	33.6%
	45.0	CTMW-03-45.0-20161201	12/01/16						61.1%	38.9%
	50.0	CTMW-03-50.0-20161201	12/01/16						66.4%	33.6%
	55.0	CTMW-03-55.0-20161201	12/01/16						76.0%	24.0%
	60.0	CTMW-03-60.0-20161201	12/01/16		-				70.9%	29.1%

Notes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

Boring Location	Sample Depth (ft bgs)	Sample ID	Sample Date	Mercury by USEPA Method 7471A (mg/kg)	Total Organic Carbon (mg/kg)	рН	Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Percent Solids	Moisture Content
	0.5	CTMW-04D-0.5-20170320	03/20/17						91.2%	8.8%
	5.0	CTMW-04D-5.0-20170322	03/22/17						92.1%	7.9%
	10.0	CTMW-04D-10.0-20170322	03/22/17						93.1%	6.9%
	15.0	CTMW-04D-15.0-20170322	03/22/17						93.8%	6.2%
	20.0	CTMW-04D-20.0-20170322	03/22/17						92.9%	7.1%
	25.0	CTMW-04D-25.0-20170322	03/22/17						52.5%	47.5%
OTMAN O 4D	25.0	CTMW-04D-25.0-20170322-FD	03/22/17						53.0%	47.0%
CTMW-04D	30.0	CTMW-04D-30.0-20170322	03/22/17						59.5%	40.5%
	35.0	CTMW-04D-35.0-20170322	03/22/17						59.9%	40.1%
	40.0	CTMW-04D-40.0-20170322	03/22/17						63.9%	36.1%
	45.0	CTMW-04D-45.0-20170322	03/22/17						60.2%	39.8%
	50.0	CTMW-04D-50.0-20170322	03/22/17						70.5%	29.5%
	55.0	CTMW-04D-55.0-20170322	03/22/17						64.5%	35.5%
	60.0	CTMW-04D-60.0-20170322	03/22/17		-				72.9%	27.1%
	0.5	CTMW-05D-0.5-20170605	06/05/17						95.0%	5.0%
	5.0	CTMW-05D-5.0-20170605	06/05/17						90.3%	9.7%
	10.0	CTMW-05D-10.0-20170605	06/05/17						84.2%	15.8%
	15.0	CTMW-05D-15.0-20170605	06/05/17		_				94.7%	5.3%
	15.0	CTMW-05D-15.0-20170605-FD	06/05/17						87.6%	12.4%
	20.0	CTMW-05D-20.0-20170605	06/05/17	0.28	12,000	7.9	36	740	74.9%	25.1%
	25.0	CTMW-05D-25.0-20170605	06/05/17						62.7%	37.3%
CTMW-05D	30.0	CTMW-05D-30.0-20170605	06/05/17						58.8%	41.2%
	35.0	CTMW-05D-35.0-20170605	06/05/17						58.4%	41.6%
	40.0	CTMW-05D-40.0-20170605	06/05/17			-			67.8%	32.2%
	45.0	CTMW-05D-45.0-20170605	06/05/17	<0.020	1,700	8.0	37	570	58.7%	41.3%
	50.0	CTMW-05D-50.0-20170605	06/05/17						65.2%	34.8%
	55.0	CTMW-05D-55.0-20170605	06/05/17						73.5%	26.5%
	60.0	CTMW-05D-60.0-20170605	06/05/17						61.7%	38.3%
	0.5	CTMW-06D-0.5-20170606	06/06/17						92.6%	7.4%
	5.0	CTMW-06D-5.0-20170606	06/06/17						95.3%	4.7%
	10.0	CTMW-06D-10.0-20170606	06/06/17						93.1%	6.9%
	10.0	CTMW-06D-10.0-20170606-FD	06/06/17						92.1%	7.9%
	15.0	CTMW-06D-15.0-20170606	06/06/17						93.9%	6.1%
	20.0	CTMW-06D-20.0-20170606	06/06/17	0.20	6,900	8.1	72	710	84.1%	15.9%
	25.0	CTMW-06D-25.0-20170606	06/06/17						46.9%	53.1%
CTMW-06D	30.0	CTMW-06D-30.0-20170606	06/06/17						56.5%	43.5%
	35.0	CTMW-06D-35.0-20170606	06/06/17						68.0%	32.0%
	40.0	CTMW-06D-40.0-20170606	06/06/17						63.5%	36.5%
	43.5	CTMW-06D-43.5-20170606	06/06/17	0.99	17,000	8.0	36	520	61.6%	38.4%
	45.0	CTMW-06D-45.0-20170606	06/06/17						59.0%	41.0%
	50.0	CTMW-06D-50.0-20170606	06/06/17						68.4%	31.6%
	55.0	CTMW-06D-55.0-20170606	06/06/17						64.4%	35.6%

lotes:

USEPA United States Environmental Protection Agency

ft bgs Feet below ground surface mg/kg Milligram per kilogram

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and /or msd Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits



Central Retention Basin

							ar recention ba		-				
						То	tal Metals by USEPA Method (mg/L)	6010B		by USEPA Method 300.1B g/L)	Α	Anions by USEPA Method 300 (mg/L)	0.0
Well Location	Sample ID	Sample Date	Week	Perchlorate by USEPA Method 314.0 (mg/L)	Hexavalent Chromium by USEPA Method 7199 (mg/L)	Chromium	Total Iron	Total Manganese	Chlorate	Chlorite	Chloride	Nitrate as N	Sulfate
	CTMW-01S-20170404	04/04/17	Baseline	440	44	44		0.000	0.500	-1	700	400	4 400
	CTMW-01S-20170404	05/03/17	PME1	410 340	11 0.026	11 1.7		0.030 0.55	2,500 870	<1 <10	790 950	120 210	1,400 1,400
	CTMW-013-20170503	05/16/17	PME2	280	<0.00025	0.49	-	0.55	730	<10	940	55	1,200
	CTMW-01S-20170531	05/31/17	PME3	140	<0.000025	0.18	1.4	0.99	650	<10	1,500	2.6	1,100
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	39	<0.000026	1.9	17	3.3	64	<20	1,300	9.5	740
	CTMW-01S-20170720	07/20/17	PME5	4	<0.000025	0.49	25	5.5	72	<5	1,500	<0.55	140
	CTMW-01S-20170824	08/24/17	PME6	32	0.0026	2.2	18	3.3	13	<10	1,300	4.8 J	1,000
	CTMW-01S-20170920	09/20/17	PME7	0.32	0.000037 J	0.086	11	3.6	<1.0	<10	970	<1.1	<130
	CTMW-01S-20171003	10/03/17	PME8	0.15 F1	<0.000025	0.084	21	2.8	0.61 J	<1	1,100	<0.55	76
	CTMW-01D-20170403	04/03/17	Baseline	1,400	24	23		0.042	4,900	<1	1,900	20	1,900
1	CTMW-01D-20170503	05/03/17	PME1	1,400	22	24		0.20	4,900	<10	1,900	21	1,800
	CTMW-01D-20170516	05/16/17	PME2	1,400	21	24		0.037 J	4,500	<10	1,700	22	1,700
	CTMW-01D-20170531	05/31/17	PME3	1,300	22	23	0.15 J	0.027 J	4,800	<10	1,700	20	1,600
OTHER OLD	CTMW-01D-20170619	06/19/17	PME4	1,400	20	22	<0.25	<0.046	4,300	<10	1,700	17	1,700
CTMW-01D	CTMW-01D-20170720	07/20/17	PME5	1,400	16	16	<0.10	0.070	4,100	<10	2,000	14	1,700
	CTMW-01D-20170720-FD	07/20/17	PME5	1,300	16	15	<0.050	0.063	4,100	<10	2,000	14	1,700
	CTMW-01D-20170824	08/24/17	PME6	1,400	13	14	0.17 J	0.20	3,700	<10	2,300	9.9	1,700
	CTMW-01D-20170920	09/20/17	PME7	1,500	12	13	0.71	0.21	3,800	<10	2,100	12	1,600
	CTMW-01D-20171003	10/03/17	PME8	1,300	12	11	0.13	0.21	3,500	<10	2,000	11	1,600
	CTMW-02S-20170405	04/05/17	Baseline	410	11	11		0.03	2,500	<10	780	160	1,500
	CTMW-02S-20170504	05/04/17	PME1	470	1.3	2.5	-	0.36	860	<10	1,300	540	1,500
	CTMW-02S-20170516	05/16/17	PME2	380	0.11	0.74		0.35	550	<10	1,200	530	1,400
	CTMW-02S-20170601	06/01/17	PME3	440	0.76	0.68	0.11	0.23	750	<10	1,300	320	1,500
CTMW-02S	CTMW-02S-20170620	06/20/17	PME4	110	<0.000025	0.16	2.1	1.30	<0.5	<0.5	1,500	<1.1	890
	CTMW-02S-20170719	07/19/17	PME5	26	<0.000025	0.084	13	2.70	<0.5	<10	1,400	0.63 J	29
	Not Analyzed	08/24/17	PME6		1		1		nable to sample	1		Т	T
	CTMW-02S-20170920	09/20/17	PME7	13	<0.000025	0.097	13	1.4	<1.0	<10	1,600	<0.28	17
	CTMW-02S-20171003	10/03/17	PME8	0.29	<0.000025	0.13	7.9	1.1	<0.5	<1	1,600	<1.1	6.5 J
	CTMW-02D-20170404	04/04/17	Baseline	960	20	23		0.090 J	4,800	<1	1,300	34	1,700
	CTMW-02D-20170404-FD	04/04/17	Baseline	930	20	21		0.076 J	4,600	<1	1,200	31	1,600
	CTMW-02D-20170503	05/03/17	PME1	1,100	15	19		0.10	4,200	<10	1,500	30	1,700
	CTMW-02D-20170503-FD	05/03/17	PME1	1,800	15	19		0.11	4,200	<10	1,600	29	1,700
	CTMW-02D-20170517 CTMW-02D-20170601	05/17/17 06/01/17	PME2 PME3	1,200 1,300	19 19	18 19	0.11	0.13 0.090	4,000 3,300	<10 <10	1,500 1,500	26 25	1,500 1,600
CTMW-02D	CTMW-02D-20170601 CTMW-02D-20170601-FD	06/01/17	PME3	1,200	18	18	0.11 0.051 J	0.090	3,400	<10	1,500	25	1,500
01.mm-02D	CTMW-02D-20170601-FD	06/01/17	PME4	1,100	16	18	<0.25	0.10	2,000	<10	1,500	25	1,600
	CTMW-02D-20170619-FD	06/19/17	PME4	1,200	18	20	<0.25	0.13	1,900	<10	1,600	22	1,600
	CTMW-02D-20170013-1-D	07/19/17	PME5	950	13	12	<0.050	0.26	4.400	<10	1,800	5.8	1,300
	CTMW-02D-20170824	08/24/17	PME6	1,200	14	16	0.17 J	0.40	3,500	<10	2,000	18	1,600
	CTMW-02D-20170920	09/20/17	PME7	2,500	13	13	6.1	0.49	3,700	<10	2,000	14	1,400
	CTMW-02D-20171003	10/03/17	PME8	1,200	15	14	0.27	0.28	3,600	<10	1,900	17	1,500
	CTMW-03S-20170405	04/05/17	Baseline	470	13	14		<0.050	2,900	<10	940	55	1,500
	CTMW-03S-20170505	05/05/17	PME1	460	13	15		0.060	3,200	<10	1,000	27	1,600
	CTMW-03S-20170517	05/17/17	PME2	510	14	15		0.058	3,200	<10	960	31	1,500
	CTMW-03S-20170601	06/01/17	PME3	610	14	13	<0.050	0.060	4,000	<10	1,000	38	1,500
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	670	4.4	5.7	0.23	0.33	1,600	<1	1,700	34	1,600
	CTMW-03S-20170718	07/18/17	PME5	540	14	14	0.055 J	0.33	3,100	<10	1,100	30	1,600
	CTMW-03S-20170823	08/23/17	PME6	600	4.8	5.7	0.15	0.60	1,600	<10	1,800	17	1,400
	CTMW-03S-20170921	09/21/17	PME7	540	14	16	<0.050	0.38	3,400	<10	1,100	26	1,500
	CTMW-03S-20171003	10/03/17	PME8	560	16	16	<0.050	0.36	3,400	<10	1,100	26	1,500

Notes:

USEPA United States Environmental Protection Agency

mg/L Milligram per lite

Concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

L Denotes a negative instrument reading had an absolute value greater than the reporting limit

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value



Central Retention Basin

				D	U	То	tal Metals by USEPA Method 6 (mg/L)	6010B		by USEPA Method 300.1B g/L)	А	nions by USEPA Method 300 (mg/L)	0.0
Well Location	Sample ID	Sample Date	Week	Perchlorate by USEPA Method 314.0 (mg/L)	Hexavalent Chromium by USEPA Method 7199 (mg/L)	Chromium	Total Iron	Total Manganese	Chlorate	Chlorite	Chloride	Nitrate as N	Sulfate
	CTMW-03D-20170406	04/06/17	Baseline	530	17	16		0.031	3,700	<10	1,100	47	1,600
	CTMW-03D-20170505	05/05/17	PME1	490	16	16		0.027	3,500	<10	1,100	48	1,600
	CTMW-03D-20170517	05/17/17	PME2	520	16	15		<0.020	3,400	<10	960	41	1,500
-	CTMW-03D-20170601	06/01/17	PME3	570	15	15	<0.050	0.019 J	3,500	<10	1,000	34	1,500
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	520	15	18	<0.25	<0.075	3,400	<1	1,200	33	1,600
	CTMW-03D-20170720	07/20/17	PME5	580	14	14	<0.050	0.018 J	3,400	<10	1,100	27	1,500
	CTMW-03D-20170823	08/23/17	PME6	610	14	15	<0.050	0.022	3,200	<10	1,100	23	1,500
-	CTMW-03D-20170921	09/21/17	PME7	540	14	16	0.24	0.051	3,400	<10	1,100	23	1,500
-	CTMW-03D-20171003	10/03/17	PME8	540	15	16	0.095 J	0.030	3,500	<10	1,100	24	1,500
	CTMW-04S-20170405	04/05/17	Baseline	420	9.9	10		0.033	2,500	<20	780	150	1,500
-	CTMW-04S-20170504	05/04/17	PME1	440	5.4	19		0.11	1,800	<10	1,100	120	1,500
	CTMW-04S-20170517	05/17/17	PME2	540	0.15	0.82		0.30	910	<10	1,500	93	1,400
	CTMW-04S-20170602	06/02/17	PME3	650	0.47	1.1	0.19	0.33	1,100	<10	1,500	51	1,400
CTMW-04S	CTMW-04S-20170620	06/20/17	PME4	560	<0.000025	0.78	2.9	0.41	290	<1	1,800	18	1,500
-	CTMW-04S-20170718	07/18/17	PME5	180	0.000034 J	0.51	2.6	1.1	20	<5	1,900	<1.1	1,100
=	CTMW-04S-20170823	08/23/17	PME6	140	<0.000025	0.23	8.7	2.1	16	<10	2,000	<1.1	190
=	CTMW-04S-20170921	09/21/17	PME7	510	<0.000025	0.12	14	2.6	5.1	<10	2,200	<1.1 F1	390 F1
-	CTMW-04S-20171003	10/03/17	PME8	120	<0.000025	0.083	15	2.0	320	<10	2,300	5.3 J	920
	CTMW-04D-20170405	04/05/17	Baseline	980	19	20		0.013 J	4,300	<10	1,600	26	1,700
=	CTMW-04D-20170504	05/04/17	PME1	950	16	6.2		0.16	4,200	<10	1,400	33	1,700
=	CTMW-04D-20170517	05/17/17	PME2	810	19	22		<0.020	4,000	<10	1,200	32	1,500
-	CTMW-04D-20170517-FD	05/17/17	PME2	730	20	21		<0.020	4,000	<10	1,200	33	1,500
-	CTMW-04D-20170602	06/02/17	PME3	860	19	19	0.084 J	<0.010	4,700	<10	1,500	31	1,600
CTMW-04D	CTMW-04D-20170621	06/21/17	PME4	990	19	21	<0.050	<0.015	3,700	<10	1,400	33	1,700
=	CTMW-04D-20170718	07/18/17	PME5	950	19	19	0.37	0.13	4,600	<10	1,900	34	2,200
=	CTMW-04D-20170823	08/23/17	PME6	780	18	19	0.082	0.035	4,100	<10	1,400	36	1,600
=	CTMW-04D-20170823-FD	08/23/17	PME6	810	18	18	1.1	0.038	4,100	<10	1,400	36	1,600
-	CTMW-04D-20170920	09/20/17	PME7	820	17	19	0.34	<0.015	3,500	<10	1,300	36	1,600
=	CTMW-04D-20171003	10/03/17	PME8	740	18	18	0.13	<0.015	3,900	<10	1,200	38	1,500
	CTMW-05S-20170621	06/21/17	PME4	560	4.9	5.5	0.088 J	0.21	2,100	<10	1,300	60	1,400
-	CTMW-05S-20170717	07/17/17	PME5	570	2.5	2.8	<0.050	0.24	1,700	<10	1,600	24	1,400
CTMW-05S	CTMW-05S-20170822	08/22/17	PME6	610	3.4	3.7	5.6	0.40	2,000	<10	1,600	32	1,400
-	CTMW-05S-20170919	09/19/17	PME7	570	2.3	2.2	<0.050	0.21	1,900	<10	1,700	14	1,300
-	CTMW-05S-20171004	10/04/17	PME8	570	5.9	5.7	<0.050	0.21	2,700	<10	1,400	28	1,400
	CTMW-05D-20170621	06/21/17	PME4	660	16	16	<0.050	<0.015	3,400	<10	1,000	73	1,400
	CTMW-05D-20170621-FD	06/21/17	PME4	590	16	18	<0.050	0.015 J	3,500	<10	1,100	73	1,500
	CTMW-05D-20170718	07/18/17	PME5	510	15 H	15	<0.050	0.10	3,400	<10	1,100	64	1,500
CTMW-05D	CTMW-05D-20170822	08/22/17	PME6	550	15	16	0.055 J	<0.015	3,500	<10	1,100	52	1,500
	CTMW-05D-20170919	09/19/17	PME7	550	15	14	0.25	0.016 J	3,300	<10	1,100	52	1,500
ļ	CTMW-05D-20171004	10/04/17	PME8	650	14	16	0.78 F1	0.028	3,400	<10	1,100	48	1,500
	CTMW-06S-20170621	06/21/17	PME4	460	<0.000025	0.31	2.5	2.0	20	<10	1,700	<1.1	950
	CTMW-06S-20170717	07/17/17	PME5	18 F1	<0.000025	0.29	5.2	4.3	19	<10	1,600	1.2 J	230
CTMW-06S	CTMW-06S-20170822	08/22/17	PME6	13	<0.000025	0.13	42	5.7	0.29	<10	1,700	<1.1	14
ļ	CTMW-06S-20170919	09/19/17	PME7	<0.01	<0.000025	0.061	68	5.7	<0.5	<10	1,700	<1.1	<5.0
	CTMW-06S-20171004	10/04/17	PME8	<0.025	<0.000025	0.062	49	7.1	<1	<10	1,600	<2.8	<13
	CTMW-06D-20170622	06/22/17	PME4	1,000	15	17	<0.050	0.042	4,000	<10	1,300	97	1,500
	CTMW-06D-20170717	07/17/17	PME5	920	17	18	<0.050	0.035	3,900	<10	1,400	84	1,500
ļ	CTMW-06D-20170717-FD	07/17/17	PME5	830	17	17	0.067 J	0.034	4,200	<10	1,500	84	1,500
CTMM/ CCD	CMTW-06D-20170822	08/22/17	PME6	950	15	15	0.63	0.10	3,700	<10	1,400	52	1,400
CTMW-06D	CMTW-06D-20170919	09/19/17	PME7	800	14	13	0.85	0.15	2,700	<10	1,700	48	1,500
ļ	CTMW-06D-20170919-FD	09/19/17	PME7	810	13	13	0.79	0.15	2,600	<10	1,600	48	1,500
ļ	CTMW-06D-20171004	10/04/17	PME8	970	12	13	0.83	0.19	3,100	<10	1,700	41	1,400
ļ	CTMW-06D-20171004-FD	10/04/17	PME8	990	13	13	0.71	0.18	3,100	<10	1,700	39	1,400

lotes:

USEPA United States Environmental Protection Agency

ng/L Milligram per lit

- Denotes concentration is less than the laboratory method detection limit indicated
- J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value
- F1 MS and / or MSD Recovery is outside acceptance limits
- F2 MS/MSD RPD exceeds control limits
- Denotes a negative instrument reading had an absolute value greater than the reporting limit
- J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value
- Not Analyzed



Central Retention Basin

							General Water C	Quality Parameters			
Well Location	Sample ID	Sample Date	Week	рН	Temp (°C)	Specific Conductivity (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Sulfide (mg/L)	Ferrous Iron (mg/L)
	CTMW-01S-20170404	04/04/17	Baseline	7.44	26.10	9.08	170	1.71	0.0	0.00	0.02
	CTMW-01S-20170503	05/03/17	PME1	5.96	28.73	14.2	-166	1.87	15.5	0.00	0.00
	CTMW-01S-20170516	05/16/17	PME2	6.68	24.39	10.7	-298	1.21	59.0	0.11	0.22
	CTMW-01S-20170531	05/31/17	PME3	6.09	28.64	11.2	-157	1.05	9.2	0.05	0.04
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	6.20	30.95	13.9	-127	0.56	455	0.08	0.30
	CTMW-01S-20170720	07/20/17	PME5	5.94	28.95	14.4	-40	0.77	74.7	0.19	0.25
	CTMW-01S-20170824	08/24/17	PME6	6.51	30.10	14.2	-71	2.06	295.0	0.25	0.19
	CTMW-01S-20170920	09/20/17	PME7	6.40	30.84	12.4	-72	0.15	34.7	0.49	_
	CTMW-01S-20171003	10/03/17	PME8	7.75	25.63	11.8	-82	1.09	30.1	0.08	>3.00
İ	CTMW-01D-20170403	04/03/17	Baseline	7.03	25.53	15.2	100	1.55	84.7	0.03	0.07
<u> </u>	CTMW-01D-20170503	05/03/17	PME1	6.49	27.00	17.3	79	1.43	81.2	0.01	0.05
	CTMW-01D-20170516	05/16/17	PME2	7.46	27.09	13.9	-23	1.14	4.8	0.00	0.15
	CTMW-01D-20170531	05/31/17	PME3	7.00	27.37	14.5	-14	0.83	0.6	0.00	0.05
CTMW-01D	CTMW-01D-20170619	06/19/17	PME4	6.97	28.55	14.0	-130	0.49	4.2	0.00	0.00
	CTMW-01D-20170720	07/20/17	PME5	6.47	26.86	15.1	-120	0.36	7.9	0.03	0.03
	CTMW-01D-20170824	08/24/17	PME6	6.38	26.79	16.1	-162	0.73	26.8	0.06	0.07
	CTMW-01D-20170920	09/20/17	PME7	6.53	25.68	14.6	-103	0.21	11.5	0.06	
	CTMW-01D-20171003	10/03/17	PME8	7.34	26.72	13.7	-19	0.28	0.0	0.09	0.06
	CTMW-02S-20170405	04/05/17	Baseline	7.45	27.19	9.23	161	1.56	0.00	0.00	0.09
	CTMW-02S-20170504	05/04/17	PME1	5.05	33.65	13.3	190	7.53	62.9	0.00	0.01
	CTMW-02S-20170516	05/16/17	PME2	6.75	31.31	11.1	-43	1.68	0.0	0.11	0.16
	CTMW-02S-20170601	06/01/17	PME3	6.70	29.55	11.2	150	1.82	6.6	0.06	0.10
CTMW-02S	CTMW-02S-20170620	06/20/17	PME4	6.76	27.70	10.5	-145	0.56	239	0.10	0.30
	CTMW-02S-20170719	07/19/17	PME5	6.60	30.00	11.5	-31	0.77	98.1	0.13	0.17
	Not Analyzed	08/24/17	PME6	0.00	00.00	11.0		able to sample	50.1	0.10	0.17
	CTMW-02S-20170920	09/20/17	PME7			H		nt water column/slow rechar	ne .		
	CTMW-02S-20171003	10/03/17	PME8	7.30	26.14	9.15	-107	0.26	45.4	0.07	3.23
	CTMW-02D-20170404	04/04/17	Baseline	7.63	27.81	12.9	120	1.18	28.9	0.06	0.11
	CTMW-02D-20170503	05/03/17	PME1	6.01	29.31	14.8	125	1.21	5.2	0.03	0.14
	CTMW-02D-20170517	05/17/17	PME2	7.13	23.23	12.9	33	3.43	130	0.03	0.00
	CTMW-02D-20170601	06/01/17	PME3	6.74	27.20	13.1	164	0.52	6.6	0.04	0.05
CTMW-02D	CTMW-02D-20170619	06/19/17	PME4	6.97	26.55	12.5	-161	0.41	7.2	0.00	0.00
-	CTMW-02D-20170719	07/19/17	PME5	6.66	25.64	13.4	39	0.68	26.7	0.03	0.02
-	CTMW-02D-20170719	08/24/17	PME6	6.60	26.31	14.6	-163	0.75	31.2	0.03	0.02
<u> </u>	CTMW-02D-20170920	09/20/17	PME7	6.82	24.55	13.3	53	0.12	39.2	0.02	
-	CTMW-02D-201710920	10/03/17	PME8	6.68	27.77	13.5	-14	0.12	20.2	0.02	0.00
	CTMW-03S-20170405	04/05/17	Baseline	7.34	27.82	9.35	161	1.88	0.0	0.00	0.00
<u> </u>	CTMW-03S-20170505	05/05/17	PME1	6.30	24.86	9.35	-3	1.40	0.5	0.00	0.00
<u> </u>	CTMW-03S-20170505	05/17/17	PME2	7.40	20.91	10.1	145	4.75	1.0	0.08	0.00
<u> </u>	CTMW-03S-20170601	06/01/17	PME3	6.89	27.63	10.6	172	1.14	0.0	0.00	0.00
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	6.53	26.22	11.3	33	0.26	84.0	0.00	0.00
	CTMW-03S-20170020	07/18/17	PME5	6.65	28.20	6.65	124	16.3	16.3	0.00	0.00
-	CTMW-03S-20170718	08/23/17	PME6	6.40	27.64	12.3	14	1.53	104.0	0.16	0.16
-	CTMW-03S-20170823	09/21/17	PME7	6.87	25.30	10.6	67	0.16	2.1	0.10	0.10
	C11V1VV-030-20170821	03/21/11	I IVI∟/	0.01	25.50	10.0	01	0.10	4.1	0.12	

Notes: USEPA United States Environmental Protection Agency

Milligram per liter mg/L

NTU Nephelometric Units

Denotes concentration was greater than the test method upper limit indicated. >3.00



Central Retention Basin

							General Water Q	uality Parameters			
Well Location	Sample ID	Sample Date	Week	рН	Temp (°C)	Specific Conductivity (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Sulfide (mg/L)	Ferrous Iron (mg/L)
	CTMW-03D-20170406	04/06/17	Baseline	7.43	22.94	10.9	214	3.39	2.1	0.00	0.00
	CTMW-03D-20170505	05/05/17	PME1	6.50	26.37	11.9	183	2.10	0.5	0.00	0.00
	CTMW-03D-20170517	05/17/17	PME2	8.71	22.65	10.5	167	4.31	0.8	0.01	0.00
	CTMW-03D-20170601	06/01/17	PME3	7.18	27.85	10.7	213	0.58	0.0	0.00	0.00
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	7.65	26.57	10.3	-193	1.15	4.6	0.00	0.00
	CTMW-03D-20170720	07/20/17	PME5	7.24	25.74	10.9	110	0.78	3.0	0.00	0.00
	CTMW-03D-20170823	08/23/17	PME6	7.33	26.52	11.2	-28	0.74	54.5	0.09	0.13
	CTMW-03D-20170921	09/21/17	PME7	7.58	24.29	9.91	71	0.12	1.0	0.03	
	CTMW-03D-20171002	10/02/17	PME8	7.98	26.17	9.26	77	1.57	0.0	0.00	0.15
	CTMW-04S-20170405	04/05/17	Baseline	7.27	23.28	9.16	139	1.36	0.0	0.00	0.02
	CTMW-04S-20170504	05/04/17	PME1	5.83	26.56	11.9	120	1.43	6.0	0.00	0.02
	CTMW-04S-20170517	05/17/17	PME2	6.68	25.85	10.6	-12	1.16	47.4	0.17	0.17
	CTMW-04S-20170602	06/02/17	PME3	6.47	27.40	11.1	192	1.45	39.0	0.02	0.03
CTMW-04S	CTMW-04S-20170620	06/20/17	PME4	6.88	30.85	10.4	-70	0.36	79	0.09	0.25
	CTMW-04S-20170718	07/18/17	PME5	6.73	29.54	11.3	-1	1.40	60.2	0.07	0.10
	CTMW-04S-20170823	08/23/17	PME6	6.58	31.23	11.8	-239	1.49	69.9	0.17	2.05
	CTMW-04S-20170921	09/21/17	PME7	6.74	26.21	10.8	-119	0.16	18.5	0.11	
	CTMW-04S-20171003	10/03/17	PME8	6.64	29.98	11.2	-242	0.18	32.1	0.00	2.02
	CTMW-04D-20170405	04/05/17	Baseline	7.17	25.44	13.4	143	1.10	4.7	0.01	0.00
	CTMW-04D-20170504	05/04/17	PME1	6.20	28.27	15.1	201	3.70	11.9	0.00	0.00
	CTMW-04D-20170517	05/17/17	PME2	8.71	23.42	12.4	185	0.89	13.7	0.01	0.07
	CTMW-04D-20170602	06/02/17	PME3	7.12	27.07	12.4	181	0.34	6.4	0.00	0.00
CTMW-04D	CTMW-04D-20170602	06/21/17	PME4	7.52	24.98	11.9	-66	0.50	6.1	0.00	0.00
01mm-04B	CTMW-04D-20170021	07/18/17	PME5	7.28	26.11	12.8	0.71	-36	18.8	0.00	0.02
	CTMW-04D-20170718	08/23/17	PME6	7.21	25.19	12.9	-69	0.78	117.0	0.21	0.26
	CTMW-04D-20170920	09/20/17	PME7	7.42	25.95	11.6	-96	0.16	4.7	0.18	0.20
	CTMW-04D-20171003	10/03/17	PME8	7.89	26.00	10.1	-131	0.16	0.0	0.00	0.00
	CTMW-05S-20170621	06/21/17	PME4	6.99	26.80	10.1	113	1.09	18.7	0.00	0.00
	CTMW-05S-20170621 CTMW-05S-20170717	06/21/17	PME5	6.57	31.61	11.9	115	0.82	11.0	0.02	0.00
CTMW-05S	CTMW-05S-20170717 CTMW-05S-20170822	08/22/17	PME6	6.78	27.66	11.8		0.87		0.00	0.04
CTWW-055							151		7.6	+	0.02
	CTMW-05S-20170919	09/19/17	PME7	6.61 6.42	28.81 25.37	11.1	163 147	0.17 0.66	4.9 0.0	0.01 0.01	
	CTMW-05S-20171004	10/04/17	PME8 PME4	7.59				1.59	8.8		0.08
	CTMW-05D-20170621	06/21/17	PME4 PME5		27.30	10.4	142			0.00	0.00
CTMW OFF	CTMW-05D-20170718	07/18/17	•	7.24	26.36	11.4	-120	0.80	3.4	0.00	0.00
CTMW-05D	CTMW-05D-20170822	08/22/17	PME6	7.47	25.59	11.6	88	0.72	9.6	0.03	0.00
	CTMW-05D-20170919	09/19/17	PME7	7.34	28.24	10.5	111	0.22	8.2	0.02	
	CTMW-05D-20171004	10/04/17	PME8	6.94	24.51	9.87	142	2.45	15.0	0.01	0.19
	CTMW-06S-20170621	06/21/17	PME4	6.74	35.23	10.1	-125	0.66	250	0.020	0.40
OTANA' CCC	CTMW-06S-20170717	07/17/17	PME5	6.60	34.26	11.7	-120	0.61	155	0.09	0.05
CTMW-06S	CTMW-06S-20170822	08/22/17	PME6	6.77	32.53	13.1	-92	6.5	123	0.33	2.17
	CTMW-06S-20170919	09/19/17	PME7	6.64	30.22	12.0	-109	0.18	124	0.08	
	CTMW-06S-20171004	10/04/17	PME8	6.46	28.33	11.5	-101	0.17	15.6	0.01	2.72
	CTMW-06D-20170622	06/22/17	PME4	7.23	24.91	11.4	85	0.15	9.7	0.00	0.00
	CTMW-06D-20170717	07/17/17	PME5	6.96	30.51	12.9	87	0.63	7.1	0.00	0.00
CTMW-06D	CMTW-06D-20170822	08/22/17	PME6	6.86	26.14	13.3	11	0.90	46.5	0.10	0.00
	CMTW-06D-20170919	09/19/17	PME7	6.75	25.40	12.7	170	0.49	27.8	0.10	
	CTMW-06D-20171004	10/04/17	PME8	6.58	27.39	11.9	180	0.55	90.7	0.24	0.27

Notes:

USEPA United States Environmental Protection Agency

C Celcius

mg/L Milligram per liter

mV Millivolt

NTU Nephelometric Units

>3.00 Denotes concentration was greater than the test method upper limit indicated.



Central Retention Basin

									General Chemistry (mg/L)					
Well Location	Sample ID	Sample Date	Week	Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Chemical Oxygen Demand	Total Organic Carbon	Total Sulfide	Total Kjeldahl Nitrogen (TKN)	Total Phosphorus	Total Dissolved Solids	Hardness as CaCO3	Orthophosphate as P	Orthophosphorus as PO4
	CTMW-01S-20170404	04/04/17	Baseline	200	200		2.4	0.024 J	<0.10	0.026 J	8,200	1,700	0.067 F1	0.21 F1
	CTMW-01S-20170503	05/03/17	PME1	2,000	2,000	7,100	2,300	<0.020	<2.5	0.52	12,000	3,700	0.34	1.0
	CTMW-01S-20170516	05/16/17	PME2	2,600 B	2,600 B	12,000	3,000	<0.020	0.76	0.37	11,000	3,300	0.72	2.2
	CTMW-01S-20170531	05/31/17	PME3	2,300	2,300	7,200	2,000	3.9	0.20	0.49	10,000	3,100	1.2	3.7
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	5,300 B	5,300 B	22,000	6,600	0.36	190	24	18,000	5,700	18	54
	CTMW-01S-20170720	07/20/17	PME5	6,300 B	6,300 B	26,000	9,000	1.2	47	3.4	20,000	11,000	0.65	2.0
	CTMW-01S-20170824	08/24/17	PME6	3700 B	3700 B	17,000	6,700	<0.027	9,500	5.5	17,000	3,900	5.6	17
	CTMW-01S-20170920	09/20/17	PME7	5200 B	5200 B	19,000	6,200	0.035 J	240	0.79 J	17,000	4,800	0.76	2.3
	CTMW-01S-20171003	10/03/17	PME8	2700 B	2700 B	17,000	6,300	0.47	210	5.2	16,000	4,300	0.47	1.4
	CTMW-01D-20170403	04/03/17	Baseline	140	140		25	0.044 J	<0.10	0.054	14,000	3,400	0.17	0.52
	CTMW-01D-20170503	05/03/17	PME1	130	130	<20	8.0	0.030 J	<0.10	0.11	14,000	3,600	0.082	0.25
	CTMW-01D-20170516	05/16/17	PME2	140	140	<20	9.8	<0.020	<0.10	<0.025	15,000	3,500	0.082	0.25
	CTMW-01D-20170531	05/31/17	PME3	160	160	<50	16	<0.30	<0.10	0.035 J	15,000	3,600	0.051 F1	0.16 F1
CTMW-01D	CTMW-01D-20170619	06/19/17	PME4	290	290	<50	11	<0.27 F1	<0.10 F1	0.028 J F1	14,000	3,400	0.085 F1	0.26 F1
	CTMW-01D-20170720	07/20/17	PME5	400	400	<50	66	<0.14	<0.10	0.029 J	12,000	3,700	0.080 F1	0.24 F1
	CTMW-01D-20170720-FD	07/20/17	PME5	380	380	<50	66	<0.27	<0.10	0.030 J	12,000	3,600	0.10	0.31
	CTMW-01D-20170824	08/24/17	PME6	740	740	480	350	<0.027	<0.10	0.22	13,000	4,000	0.10	0.31
	CTMW-01D-20170920	09/20/17	PME7	640	640	410	430	<0.027	<0.10	0.16	14,000	4,000	0.20	0.61
	CTMW-01D-20171003	10/03/17	PME8	920	920	630	440	<0.027	<0.50	0.099	13,000	4,000	0.20	0.62
	CTMW-02S-20170405	04/05/17	Baseline	160	160		2.0	<0.020	<0.10	<0.025	8,400	1,500	0.057	0.18
	CTMW-02S-20170504 CTMW-02S-20170516	05/04/17 05/16/17	PME1 PME2	940	940	58 37 J	53	<0.080 <0.020	<0.10 <0.10	0.26	10,000	2,500	0.15 F1	0.46 F1
	CTMW-02S-20170516	06/01/17	PME3	1,200 1,200	1,200 1,200	140	14 15	<0.14	<0.10	0.39	10,000 8,700	2,400 1,900	0.19 0.27	0.59 0.81
CTMW-02S	CTMW-02S-20170601 CTMW-02S-20170620	06/20/17	PME4	3,300 B	3,300 B	5,200	1,500	0.090	16	2.1	9,900	2,400	1.2	3.7
01WW-023	CTMW-02S-20170020	07/19/17	PME5	3,800 B	3,800 B	5,400	2,300	0.16	23	2.6	11,000	2,700	0.56	1.7
	Not Analyzed	08/24/17	PME6	3,000 B	3,000 B	5,400	2,300	0.10	Well Dry; Unable to sample	2.0	11,000	2,700	0.56	1.7
	CTMW-02S-20170920	09/20/17	PME7	5,900 B	5,900 B	5,400	2,000	<0.027	65	1.8	11,000	2,500	0.39	1.2
	CTMW-02S-20171003	10/03/17	PME8	2,400 B	2,400 B	5,700	1,900	0.29	68	1.1	10,000	2,400	0.54	1.7
	CTMW-02D-20170404	04/04/17	Baseline	190	190		18	0.052	<0.10	0.045 J	11,000	2,500	0.074	0.23
	CTMW-02D-20170404-FD	04/04/17	Baseline	190	190	_	18	0.025 J	<0.10	0.051	12,000	2,400	0.081	0.25
	CTMW-02D-20170503	05/03/17	PME1	270	270	<20	12	<0.20	<0.10	<0.025	13,000	2,900	0.052	0.16
	CTMW-02D-20170503-FD	05/03/17	PME1	270	270	<20	12	<0.020	<0.10	0.025 J	12,000	2,900	0.052	0.16
	CTMW-02D-20170517	05/17/17	PME2	340	340	<20	11	<0.50	<0.10	0.030 J	13,000	3,200	0.064	0.19
	CTMW-02D-20170601	06/01/17	PME3	290	290	<50	6.2	<0.27	<0.10	0.029 J	13,000	3,200	0.065	0.20
CTMW-02D	CTMW-02D-20170601-FD	06/01/17	PME3	320	320	<50	7.5	<0.27	<0.10	0.029 J	13,000	3,100	0.065	0.20
	CTMW-02D-20170619	06/19/17	PME4	450	450	<50	90	<0.27	<0.10	<0.025	12,000	3,100	0.033 J	0.10 J
	CTMW-02D-20170619-FD	06/19/17	PME4	420	420	<50	88	<0.27	<0.10	<0.025	12,000	3,100	0.035 J	0.11 J
	CTMW-02D-20170719	07/19/17	PME5	890	890	<50	150	<0.054	<0.10	0.027 J	12,000	3,100	0.12	0.35
	CTMW-02D-20170824	08/24/17	PME6	540	540	<50	17	<0.027	<0.10	0.11	13,000	3,300	0.1 F1	0.32 F1
	CTMW-02D-20170920	09/20/17	PME7	510	510	<50	8.6	<0.027	<0.10	0.095	12,000	3,300	0.21 F1 F2	0.65 F1 F2
	CTMW-02D-20171003	10/03/17	PME8	590	590	<20	7.8	<0.027	<0.50	0.025	12,000	3,300	0.11	0.34
	CTMW-03S-20170405	04/05/17	Baseline	140	140		1.8	<0.020	<0.10	<0.025	8,700	1,700	0.036 J	0.11 J
	CTMW-03S-20170505	05/05/17	PME1	200	200	<20	2.4	<0.020	<0.10	<0.025	9,600	1,900	0.081 F1	0.25 F1
	CTMW-03S-20170517	05/17/17	PME2	190	190	<20	2.5	<0.50	<0.10	<0.025	9,500	1,900	0.053	0.16
	CTMW-03S-20170601	06/01/17	PME3	200	200	<50	2.1	<0.27	<0.10	0.028 J	9,800	1,900	0.059	0.18
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	1,200	1,200	850	250	<0.14	<0.10	0.88	10,000	2,400	0.44	1.4
	CTMW-03S-20170718	07/18/17	PME5	320	320	<50	5.4	0.077	<0.10	0.046 J	9,400	2,000	0.17	0.51
	CTMW-03S-20170823	08/23/17	PME6	880	880	<20	39	<0.027	<0.10	0.18	9,600	2,200	0.10	0.31
	CTMW-03S-20170921	09/21/17	PME7	300	300	<50	2.8	<0.027	<0.10	0.094	10,000	2,000	0.18	0.54
	CTMW-03S-20171003	10/03/17	PME8	370	370	<20	2.6	<0.027	<0.50	0.049 J	10,000	2,000	0.16	0.48

Notes

USEPA United States Environmental Protection Agency

mg/L Milligram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

L Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

									General Chemistry (mg/L)					
Well Location	Sample ID	Sample Date	Week	Alkalinity as CaCO3	Bicarbonate Alkalinity a: CaCO3	S Chemical Oxygen Demand	Total Organic Carbon	Total Sulfide	Total Kjeldahl Nitrogen (TKN)	Total Phosphorus	Total Dissolved Solids	Hardness as CaCO3	Orthophosphate as P	Orthophosphorus as PO4
	CTMW-03D-20170406	04/06/17	Baseline	130	130	-	2.7	<0.020	<0.10	<0.025	9,600	1,800	0.038 J	0.12 J
	CTMW-03D-20170505	05/05/17	PME1	150	150	<20	3.0	<0.020	<0.10	<0.025	11,000	1,700	0.044 J	0.14 J
	CTMW-03D-20170517	05/17/17	PME2	150	150	<20	2.5	<0.50	<0.10	<0.025	9,800	1,700	0.033 J F1	0.10 J F1
	CTMW-03D-20170601	06/01/17	PME3	160	160	<50 F1	2.0	<0.27	<0.10 F1	<0.025 F1	9,900	1,700	0.031 J F1	0.094 J F1
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	170	170	<20	2.2	<0.081	<0.10	<0.025	9,700	1,700	0.022 J	0.068 J
	CTMW-03D-20170720	07/20/17	PME5	180	180	<20	2.0	<0.054	<0.10	<0.025	10,000	1,800	0.064 F1	0.20 F1
	CTMW-03D-20170823	08/23/17	PME6	170	170	<20	2.0	<0.027	<0.10	0.040 J	9,900	1,700	0.042 J	0.13 J
	CTMW-03D-20170921	09/21/17	PME7	150	150	<50	1.9	<0.027	<0.10	<0.025	9,800	1,700	0.055 F1	0.17 F1
	CTMW-03D-20171003	10/03/17	PME8	180	180	<20	2.8	<0.027	<0.50	<0.025	9,700	1,700	0.058	0.18
	CTMW-04S-20170405	04/05/17	Baseline	180	180		2.0	<0.020	<0.10	0.037 J	8,200	1,700	0.078	0.24
	CTMW-04S-20170504	05/04/17	PME1	730	730	<20	56	<0.020	<0.10	0.095	8,700	2,000	0.049 J	0.15
	CTMW-04S-20170517	05/17/17	PME2	1,600	1,600	1,100	250	<0.50	<0.10	0.32	8,800	2,600	0.54	1.6
	CTMW-04S-20170602	06/02/17	PME3	1,400	1,400	360	58	<0.11	<0.10	0.41 F1	9,600	2,500	0.067 F1	0.21 F1
CTMW-04S	CTMW-04S-20170620	06/20/17	PME4	1,600	1,600	820	170	<0.054	<0.10	0.43	8,300	2,300	0.23	0.69
	CTMW-04S-20170718	07/18/17	PME5	1,900	1,900	980	320	0.073	<0.10	0.38	7,600	2,400	0.51	1.60
	CTMW-04S-20170823	08/23/17	PME6	2,900	2,900	3,000	1,800	0.41	<0.10	0.97	9,300	2,700	1.0	3.1
	CTMW-04S-20170921	09/21/17	PME7	1,600	1,600	1,400	820	<0.027	1.8	1.3	8,000	2,400	0.036 J	0.11 J
	CTMW-04S-20171003	10/03/17	PME8	2,100	2,100	440	140	0.47	<0.50	1.0	8,000	2,300	0.43	1.3
	CTMW-04D-20170405	04/05/17	Baseline	120	120		5.7	0.020 J	<0.10	<0.025	12,000	2,500	0.029 J	0.089 J
	CTMW-04D-20170504	05/04/17	PME1	140	140	<20	2.9	<0.040	<0.10	0.041 J	12,000	2,400	0.037 J	0.11 J
	CTMW-04D-20170517	05/17/17	PME2	140	140	<20	3.4	<0.50	<0.10	<0.025	12,000	2,400	0.044 J	0.14 J
	CTMW-04D-20170517-FD	05/17/17	PME2	140	140	<20	3.6	<0.50	<0.10	<0.025	12,000	2,400	0.058	0.18
CTMW-04D	CTMW-04D-20170602	06/02/17	PME3	140	140	<50	3.0	<0.14	<0.10	<0.025	12,000	2,500	0.055	0.17
CTWW-04D	CTMW-04D-20170621	06/21/17	PME4	140	140 140	<50 <50	2.6	<0.054 <0.027	<0.10	<0.025 <0.025	11,000	2,500	0.044 J	0.14 J
	CTMW-04D-20170718 CTMW-04D-20170823	07/18/17 08/23/17	PME5 PME6	140 130	130	<20	2.4	<0.027	<0.10 <0.10	0.032 J	12,000 12,000	2,400 2,400	0.052 0.051	0.16 0.16
	CTMW-04D-20170823-FD	08/23/17	PME6	120	120	<20	2.6	<0.027	<0.10	<0.025	12,000	2,400	0.061	0.19
	CTMW-04D-20170823-FD	09/20/17	PME7	130	130	<50 <50	3.3	<0.027	<0.17	<0.025	11,000	2,400	0.061	0.19
	CTMW-04D-201710920 CTMW-04D-20171003	10/03/17	PME8	160	160	<20	3.7	<0.027	<0.10	<0.025	11,000	2,100	0.056	0.17
	CTMW-05S-20170621	06/21/17	PME4	760	760	<50	8.6	<0.081	<0.10	0.033 J	9,300	2,300	0.099	0.30
	CTMW-05S-20170717	07/17/17	PME5	1100	1100	<50	7.1	0.028 J	<0.10	0.027 J	9,600	2,300	0.13	0.40
CTMW-05S	CTMW-05S-20170822	08/22/17	PME6	820	820	<20	11	<0.027	<0.10	0.19	9,300	2,400	0.039 J	0.12 J
	CTMW-05S-20170919	09/19/17	PME7	750	750	<20	7.1	<0.027	<0.10	0.037 J	9,600	2,300	0.82	2.5
	CTMW-05S-20171004	10/04/17	PME8	800	800	<20	3.5	<0.027	<0.10	<0.025	10,000	2,200	0.31	0.94
	CTMW-05D-20170621	06/21/17	PME4	160	160	<50	3.5	<0.054	<0.10	<0.025	9,900	1,900	0.078	0.24
	CTMW-05D-20170621-FD	06/21/17	PME4	160	160	<50	3.1	<0.054	<0.10	<0.025	9,900	1,900	0.054	0.17
	CTMW-05D-20170718	07/18/17	PME5	160	160	<50 F1	2.3	<0.027 F1	<0.10 F1	<0.025 F1	9,700	1,900	0.053 F1	0.16 F1
CTMW-05D	CTMW-05D-20170822	08/22/17	PME6	160	160	<20	2.6	<0.027	<0.17	<0.025	10,000	1,800	0.024 J	0.073 J
	CTMW-05D-20170919	09/19/17	PME7	140	140	<20	2.3	<0.027	<0.10	<0.025	11,000	2,000	0.42	1.3
	CTMW-05D-20171004	10/04/17	PME8	180	180	<20 F1	2.3	<0.027 F1	<0.10 F1	<0.025 F1	10,000	1,800	0.077 F1	0.24 F1
	CTMW-06S-20170621	06/21/17	PME4	2,400 B	2,400 B	3,300	730	0.58	0.48	0.40	7,300	2,600	0.084	0.26
	CTMW-06S-20170717	07/17/17	PME5	3,800 B	3,800 B	9,800	3,100	7.3	15	0.93	11,000	3,700	0.670	2.00
CTMW-06S	CTMW-06S-20170822	08/22/17	PME6	4,400	4,400	6,700	3,200	<0.027	30	2.0	11,000	3,600	0.30	0.93
	CTMW-06S-20170919	09/19/17	PME7	2,300 B	2,300 B	7,100	2,700	<0.027	44	1.6	12,000	3,700	2.7	8.2
	CTMW-06S-20171004	10/04/17	PME8	2,600 B	2,600 B	10,000	3,000	0.20	54	2.7	12,000	3,700	2.2	6.7
	CTMW-06D-20170622	06/22/17	PME4	240	240	<50	3.5	<0.11	<0.10	<0.025	12,000	2,600	0.054	0.17
	CTMW-06D-20170717	07/17/17	PME5	210	210	<50	4.9	0.030 J	<0.10	<0.025	11,000	2,600	0.064	0.2
	CTMW-06D-20170717-FD	07/17/17	PME5	210	210	<50	5.8	0.029 J	<0.10	<0.025	12,000	2,700	0.057	0.18
CTMW-06D	CMTW-06D-20170822	08/22/17	PME6	340	340	<50	25	<0.027	<0.10	0.13	12,000	2,700	0.084	0.26
C 1 M/VV-00D	CMTW-06D-20170919	09/19/17	PME7	390	390	<20	85	<0.027 F1	<0.10	0.034 J	11,000	2,600	0.58	1.8
	CTMW-06D-20170919-FD	09/19/17	PME7	400	400	<20	82	<0.027	<0.10	0.040 J	11,000	2,600	0.44	1.3
	CTMW-06D-20171004	10/04/17	PME8	590	590	<50	120	<0.027	<0.10	<0.025	11,000	2,800	0.15	0.46
	CTMW-06D-20171004-FD	10/04/17	PME8	590	590	<20	110	<0.027	<0.10	0.029 J	11,000	2,700	0.12	0.36

Notes:

USEPA United States Environmental Protection Agency

mg/L Milligram per liter

- B Compound was found in the blank and the sample
- Denotes concentration is less than the laboratory method detection limit indicated
- J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value
- 1 MS and / or MSD Recovery is outside acceptance limits
- MS/MSD RPD exceeds control limits
- Denotes a negative instrument reading had an absolute value greater than the reporting limit
- Not Analyzed



Central Retention Basin

							Volatile F (m	atty Acids g/L)		
Well Location	Sample ID	Sample Date	Week	Dissolved Methane (mg/L)	Acetic Acid	Formic-acid	Lactic Acid	n-Butyric Acid	Propionic Acid	Pyruvic Acid
	CTMW-01S-20170404	04/04/17	Baseline	<0.00025	<0.29	3.0	<0.31	<0.26	<0.35	<7.4
	CTMW-01S-20170503	05/03/17	PME1	<0.00025	820	400	660	990	200	<7.4
	CTMW-01S-20170516	05/16/17	PME2	<0.00025	540	180	<31	1,600	300	<37
	CTMW-01S-20170531	05/31/17	PME3	<0.00025	880	<13	<16	<13	380	<19
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	<0.00025	3,000	<26	<31	4,100	2,000	<37
	CTMW-01S-20170720	07/20/17	PME5	0.16	<15	<13	<16	<13	<18	<19
	CTMW-01S-20170824	08/24/17	PME6	0.15	3,900	<5.2	<6.2	2,400	1,800	<7.4
	CTMW-01S-20170920	09/20/17	PME7	0.95	4,400	<2.6	<3.1	2,600	2,000	<3.7
	CTMW-01S-20171003	10/03/17	PME8	1.8	4,200	<5.2	<6.2	2,500	1,900	<7.4
	CTMW-01D-20170403	04/03/17	Baseline	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-01D-20170503	05/03/17	PME1	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4 F1
	CTMW-01D-20170516	05/16/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-01D-20170531	05/31/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-01D	CTMW-01D-20170619	06/19/17	PME4	<0.00025	<15 F1	<13	<16	<13	<18	<19 F1
	CTMW-01D-20170720	07/20/17	PME5	0.00040 J	50	<5.2	22	<5.2	<7.0	<7.4 F1
	CTMW-01D-20170720-FD	07/20/17	PME5	<0.00025	38	<5.2	18 J	<5.2	<7.0	<7.4
	CTMW-01D-20170824	08/24/17	PME6	0.014	170	<5.2	80	220	7.0 J	<7.4 <3.7 F1 F2
	CTMW-01D-20170920	09/20/17	PME7	0.29	160	<2.6 F2	54	350	<3.5 F1	
	CTMW-01D-20171003 CTMW-02S-20170405	10/03/17	PME8	0.038	160 <1.5	<5.2	36 <1.6	350	33 <1.8	<7.4
	CTMW-02S-20170405	04/05/17 05/04/17	Baseline PME1	<0.00025 <0.00025	11	<1.3 <0.26	<0.31	<1.3 <0.26	<0.35	<1.9 <7.4
	CTMW-02S-20170516	05/16/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-02S-20170601	06/01/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-02S	CTMW-02S-20170620	06/20/17	PME4	0.027	1,500	<13	<16	490	490	<19
	CTMW-02S-20170719	07/19/17	PME5	0.15	4,000	<5.2	<6.2	430	660	<74
	Not Analyzed	08/24/17	PME6	5.1.5	1,000		Well Dry; Unable to sample			
	CTMW-02S-20170920	09/20/17	PME7	1.9	3,300	<2.6	20	480	340	<3.7
	CTMW-02S-20171003	10/03/17	PME8	2.3	3,200	<5.2	<6.2	560	280	<7.4
	CTMW-02D-20170404	04/04/17	Baseline	<0.00025	<0.29	<0.26 F1	<0.31 F1	<0.26 F1	<0.35 F1	<7.4
	CTMW-02D-20170404-FD	04/04/17	Baseline	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-02D-20170503	05/03/17	PME1	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-02D-20170503-FD	05/03/17	PME1	<0.00025	<0.29 F1	<0.26	<0.31 F1	<0.26 F1 F2	<0.35 F1	<7.4
	CTMW-02D-20170517	05/17/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-02D-20170601	06/01/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-02D	CTMW-02D-20170601-FD	06/01/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-02D-20170619	06/19/17	PME4	0.00041 J	<15	<13	<16	40 J	27 J	<19
	CTMW-02D-20170619-FD	06/19/17	PME4	0.00054 J	49 J	<13	<16	42 J	31 J	<19
	CTMW-02D-20170719	07/19/17	PME5	0.00038 J	220	<1.3	<1.6	<1.3	<1.8	<19
	CTMW-02D-20170824	08/24/17	PME6	0.079	7.0 J	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-02D-20170920	09/20/17	PME7	0.11	<2.9	<2.6	<3.1	<2.6	<3.5	<3.7
	CTMW-02D-20171003	10/03/17	PME8	0.058	<2.9	<2.6	<3.1	<2.6	<3.5	<3.7
	CTMW-03S-20170405	04/05/17	Baseline	<0.00025	<1.5	<1.3 F1	<1.6 F1	<1.3	<1.8	<1.9 F1
	CTMW-03S-20170505	05/05/17	PME1	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-03S-20170517	05/17/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-03S-20170601	06/01/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	<0.00025	120	<13	<16	140	72	<19
	CTMW-03S-20170718	07/18/17	PME5	0.0033	<1.5	<1.3	<1.6	<1.3	<1.8	<19
	CTMW-03S-20170823	08/23/17	PME6	0.025	66	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-03S-20170921	09/21/17	PME7	0.014	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-03S-20171003	10/03/17	PME8	0.41	<2.9	<2.6	<3.1	<2.6	<3.5	<3.7

Notes:

USEPA United States Environmental Protection Agency

mg/L Milligram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

L Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

								atty Acids g/L)		
Well Location	Sample ID	Sample Date	Week	Dissolved Methane (mg/L)	Acetic Acid	Formic-acid	Lactic Acid	n-Butyric Acid	Propionic Acid	Pyruvic Acid
	CTMW-03D-20170406	04/06/17	Baseline	<0.00025	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-03D-20170505	05/05/17	PME1	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-03D-20170517	05/17/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-03D-20170601	06/01/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-03D-20170720	07/20/17	PME5	<0.00025	<1.5	<1.3	<1.6	<1.3	<1.8	<19
	CTMW-03D-20170823	08/23/17	PME6	0.030	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-03D-20170921	09/21/17	PME7	0.0084	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-03D-20171003	10/03/17	PME8	0.0096	<2.9	<2.6	<3.1	<2.6	<3.5	<3.7
	CTMW-04S-20170405	04/05/17	Baseline	<0.00025	<1.5	<1.3 F1	<1.6	<1.3	<1.8	<1.9
	CTMW-04S-20170504	05/04/17	PME1	<0.00025	55	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-04S-20170517	05/17/17	PME2	<0.00025	70	<13	<16	54	<18	<19
CTMW-04S	CTMW-04S-20170602	06/02/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
C1MW-045	CTMW-04S-20170620	06/20/17	PME4 PME5	<0.00025 0.0037	85 570	<13	<16 <1.6	30 J	83 <1.8	<19
	CTMW-04S-20170718 CTMW-04S-20170823	07/18/17 08/23/17	PME6	0.0037	2,800	<1.3 <5.2	<6.2	<1.3 <5.2	<7.0	<1.9 <7.4
	CTMW-04S-20170823	09/21/17	PME7	<0.0052	1,800	<2.6	<3.1	<2.6	<3.5	<3.7
	CTMW-04S-20171003	10/03/17	PME8	0.094	300	<13	<16	<13	<18	<19
	CTMW-04D-20170405	04/05/17	Baseline	<0.00025	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-04D-20170504	05/04/17	PME1	<0.00025	<0.29	<0.26	<0.31	<0.26	<0.35	<7.4
	CTMW-04D-20170517	05/17/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-04D-20170517-FD	05/17/17	PME2	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-04D-20170602	06/02/17	PME3	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-04D	CTMW-04D-20170621	06/21/17	PME4	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-04D-20170718	07/18/17	PME5	<0.00025	<1.5	<1.3	<1.6	<1.3	<1.8	<19
	CTMW-04D-20170823	08/23/17	PME6	0.014	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-04D-20170823-FD	08/23/17	PME6	0.015	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-04D-20170920	09/20/17	PME7	0.032	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-04D-20171003	10/03/17	PME8	0.029	<2.9	<2.6	<3.1	<2.6	<3.5	<3.7
	CTMW-05S-20170621	06/21/17	PME4	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-05S-20170717	07/17/17	PME5	<0.00099	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
CTMW-05S	CTMW-05S-20170822	08/22/17	PME6	0.0037	9.5 J	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-05S-20170919	09/19/17	PME7	<0.00025	<1.5	<1.3	<1.6	<1.3	<1.8	<1.9
	CTMW-05S-20171004	10/04/17	PME8	0.11	<2.9	<2.6	<3.1	<2.6	<3.5	<19
	CTMW-05D-20170621	06/21/17	PME4	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-05D-20170621-FD	06/21/17	PME4	<0.00025	<15	<13	<16	<13	<18	<19
CTMW-05D	CTMW-05D-20170718	07/18/17	PME5	<0.00025	<1.5 F1 F2	<1.3 F1 F2	<1.6 F1	<1.3 F2	<1.8 F1 F2	<19 F1
	CTMW-05D-20170822	08/22/17	PME6	<0.00025	<15	<13	<16	<13	<18	<19
	CTMW-05D-20170919 CTMW-05D-20171004	09/19/17 10/04/17	PME7 PME8	<0.00025 0.00044 J	<1.5 <2.9	<1.3 <2.6	<1.6 <3.1 F1	<1.3 <2.6	<1.8 <3.5 F1	<1.9 <19 F1
	CTMW-06S-20171004 CTMW-06S-20170621	06/21/17	PME4	<0.00044 J <0.00025	<2.9 430	<2.6	<3.1 F1 <16	240	100	<19 F1 <19
	CTMW-06S-20170717	07/17/17	PME5	0.0084	2,800	<13	<16	710	550	<19
CTMW-06S	CTMW-06S-20170717	08/22/17	PME6	0.049	3,200	<13	<16	690	550	<19
	CTMW-06S-20170919	09/19/17	PME7	0.078	3,600	<5.2	<6.2	970	440	<7.4
	CTMW-06S-20171004	10/04/17	PME8	0.27	3,700	<13	<16	1,200	750	<19
	CTMW-06D-20170622	06/22/17	PME4	<0.00025	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-06D-20170717	07/17/17	PME5	<0.00025	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
	CTMW-06D-20170717-FD	07/17/17	PME5	<0.00099	<5.8	<5.2	<6.2	<5.2	<7.0	<7.4
OTHER 222	CMTW-06D-20170822	08/22/17	PME6	0.00071 J	<29	<26	<31	<26	<35	<37
CTMW-06D	CMTW-06D-20170919	09/19/17	PME7	0.00034 J	96	<1.3	<1.6	26	<1.8	<1.9
	CTMW-06D-20170919-FD	09/19/17	PME7	0.00033 J	97	<1.3	<1.6	26	<1.8	<1.9
	CTMW-06D-20171004	10/04/17	PME8	0.0029	140	<2.6	<3.1	16	<3.5	<19
	CTMW-06D-20171004-FD	10/04/17	PME8	0.0024	130	<2.6	11	<2.6	26	<19

lotes:

USEPA United States Environmental Protection Agency

mg/L Milligram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and / or MSD Recovery is outside acceptance limits

MS/MSD RPD exceeds control limits

Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

												Dissolved N	Metals by USEPA	Method 6020								
													(ug/L)									
Well Location	Sample ID	Sample Date	Week	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
	CTMW-01S-20170404	04/04/17	Baseline	<50	<5.0	85	41	<2.5	<2.5	10,000 B	<5.0	<5.0	<80	<5.0	32 B	5.5 J	<5.0	<5.0	<5.0	38	<50	<25
	CTMW-01S-20170503	05/03/17	PME1	49	8.8	200	62	<0.25	<0.25	1,100	5.0	10	660	<0.50	510	51	2.5	<0.50	<0.50	200	3.5	9.3 J
	CTMW-01S-20170516	05/16/17	PME2	26	0.53 J	210	58	<0.25	<0.25	360	3.4	4.6	32	0.62 J	480	7.6	2.3	<0.50	<0.50	210	19	10 J
	CTMW-01S-20170531	05/31/17	PME3	<50	<5.0	350	75	<2.5	<2.5	150	<5.0	<5.0	780	<5.0	910	13 J	<5.0	<5.0	<5.0	190	<10	<25
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	<50	<5.0	460	47	<2.5	<2.5	150	5.2 J	13 J	370 B	<5.0	2,600	61	<5.0	<5.0	<5.0	23	<10	<25
	CTMW-01S-20170720	07/20/17	PME5	48 J B	<2.5	380	400	<1.3	<1.3	110	3.7 J	4.2 J	5,200	<2.5	4,500	37 B	<2.5	<2.5	<2.5	6.6	<5.0	17 J B
	CTMW-01S-20170824	08/24/17	PME6 PME7	<50	<5.0	910	360	<2.5	<2.5	90	<5.0	<5.0	390 B	<5.0	2,300	30	<5.0	<5.0	<5.0	80	19 J	<25
	CTMW-01S-20170920 CTMW-01S-20171003	09/20/17 10/03/17	PME7 PME8	<25 <25	4.2 J <2.5	700 440	570 610	<1.3 <1.3	<1.3 <1.3	67 59	2.8 J <2.5	3.0 J 2.8 J	220 B 430	<2.5 <2.5	3,200 3,000	18 15	<2.5 <2.5	<2.5 <2.5	<2.5 <2.5	5.2	8.1 J <5.0	<13 16 J
	CTMW-015-20171003	04/03/17	Baseline	<500	<50	440 <50	<50	<25	<25	22,000	<50	<50	<320	<50	3,000 <50	<50	<50	<50	<50	5.2 <50	<40	<250
	CTMW-01D-20170503	05/03/17	PME1	36	0.96 J	20	47	<0.25	<0.25	28,000	0.77 J	2.5	65	<0.50	44	5.1	3.5	<0.50	<0.50	29	<150	6.7 J
	CTMW-01D-20170516	05/16/17	PME2	12	<0.50	21	43	<0.25	<0.25	21,000	0.83 J	2.3 F1	55	1.2	58 F1	6.6 F1	2.4 F1	<0.50	<0.50	30	<250	9.5 J F1
	CTMW-01D-20170531	05/31/17	PME3	<50	<5.0	24	43	<2.5	<2.5	21,000	<5.0	<5.0	<80	<5.0	36	6.3 J	<5.0	<5.0	<5.0	43	<10	<25
071111 040	CTMW-01D-20170619	06/19/17	PME4	<50	<5.0	33	43	<2.5	<2.5	18,000	<5.0	<5.0	<80	<5.0	46	<5.0	<5.0	<5.0	<5.0	67	<10	<25
CTMW-01D	CTMW-01D-20170720	07/20/17	PME5	<25	<2.5	39	47	<1.3	<1.3	15,000	<2.5	3.5 J	<40	<2.5	85	8.0 J B	7.3 J	<2.5	<2.5	140	<5.0 L F1	32 J B F1
	CTMW-01D-20170720-FD	07/20/17	PME5	<25	<2.5	43	49	<1.3	<1.3	17,000	<2.5	3.2 J	100	<2.5	88	7.6 J B	6.8 J	<2.5	<2.5	140	<5.0 L	<13
	CTMW-01D-20170824	08/24/17	PME6	<50	<5.0	33	50	<2.5	<2.5	11,000	<5.0	<5.0	<80	<5.0	180	8.0 J	6.0 J	<5.0	<5.0	230	<10 L	<25
	CTMW-01D-20170920	09/20/17	PME7	<25	<2.5	32	51	<1.3	<1.3	12,000	<2.5	3.0 J	83 J B	<2.5	200	7.4 J	5.3 J	<2.5	<2.5	230	<5.0 L	<13
	CTMW-01D-20171003	10/03/17	PME8	6.2 J	0.54 J	29	53	<0.25	<0.25	13,000	0.50 J	0.58 J	<8.0	<0.50	200	2.7	4.8	<0.50	<0.50	220	7.5	3.7 J
	CTMW-02S-20170405	04/05/17	Baseline	<50	<5.0	73	36	<2.5	<2.5	11,000	<5.0	<5.0	<800 F1	<5.0	38	11 J	<5.0	<5.0	<5.0	31	<100	86 J F1
	CTMW-02S-20170504	05/04/17	PME1	27	1.6 J	85	58	<0.25	<0.25	1,500	2.1	24	79	<0.50	290	11	1.6 J	<0.50	<0.50	200	<150	18 J
	CTMW-02S-20170516	05/16/17	PME2 PME3	6.3 J	<0.50	53	53	<0.25	<0.25	240	2.1	5.2	38	<0.50	270	22 4.4	2.4	<0.50	<0.50	260 380	20	13 J
CTMW-02S	CTMW-02S-20170601 CTMW-02S-20170620	06/01/17 06/20/17	PME4	8.7 J <50	<0.50 <5.0	110 850	40 58	<0.25 <2.5	<0.25 <2.5	580 130	1.3 <5.0	5.1 <5.0	<8.0 2,000 B	<0.50 <5.0	180 1,000	4.4 19 J	<5.0	<0.50 <5.0	<0.50 <5.0	420	13 11 J	5.1 J <25
01MW-025	CTMW-023-20170020	07/19/17	PME5	<50	5.0 J	640	350	<2.5	<2.5	42	<5.0	<5.0	6.800 B	<5.0	2,400	9.0 J	<5.0	<5.0	<5.0	63	<10	<25
	Not Analyzed	08/24/17	PME6		0.00	040		2.0	2.0	, 	0.0		I Dry; Unable to sa	l .	2,400	0.00	0.0	0.0	.0.0		1	
	CTMW-02S-20170920	09/20/17	PME7	<25	3.0 J	530	360	<1.3	<1.3	46	<2.5	24	3,500 B	<2.5	1,200	11	<2.5	<2.5	<2.5	25	9.8 J	14 J
	CTMW-02S-20171003	10/03/17	PME8	<10	2.5 J	340	430	<0.50	<0.50	37	<1.0	18	340	1.2 J	850	5.9	<1.0	<1.0	<1.0	4.1	6.4	22 J
	CTMW-02D-20170404	04/04/17	Baseline	<5.0	<0.50	28	41	<0.25	<0.25	18,000 B	0.80 J	1.9 J	<80	<0.50	58 B	3.7	4.2 F1	<0.50	<0.50	39	<100	3.6 J F2
	CTMW-02D-20170404-FD	04/04/17	Baseline	6.4 J	<0.50	28	39	<0.25	<0.25	18,000 B	0.76 J	1.8 J	<80	<0.50	55 B	3.9	3.6	<0.50	<0.50	36	<100	4.7 J
	CTMW-02D-20170503	05/03/17	PME1	30	1.0 J	36	44	<0.25	<0.25	20,000	0.81 J	1.8 J	64	<0.50	100	5.0	3.2	<0.50	<0.50	62	<150	9.3 J
	CTMW-02D-20170503-FD	05/03/17	PME1	40	0.91 J	38	47	<0.25	<0.25	22,000	0.84 J	1.9 J	81	<0.50	110	5.0	3.5	<0.50	<0.50	65	<150	9.8 J
	CTMW-02D-20170517	05/17/17	PME2	<25	<2.5	27	47	<1.3	<1.3	19,000	<2.5	<2.5	82 J	<2.5	86	5.6 J	4.9 J	<2.5	<2.5	86	<200	14 J
OTM:// COD	CTMW-02D-20170601	06/01/17	PME3	<50	<5.0	39	52	<2.5	<2.5	21,000	<5.0	<5.0	<80	<5.0	120	6.5 J	<5.0	<5.0	<5.0	94	<10	<25
CTMW-02D	CTMW-02D-20170601-FD	06/01/17	PME3	<50 <50	<5.0	39	52	<2.5	<2.5	20,000	<5.0	<5.0	<80	<5.0	140	5.5 J <5.0	<5.0	<5.0	<5.0	100	<10	<25
	CTMW-02D-20170619 CTMW-02D-20170619-FD	06/19/17 06/19/17	PME4 PME4	<50 <50	<5.0 <5.0	47 45	42 43	<2.5 <2.5	<2.5 <2.5	15,000 16,000	<5.0 <5.0	<5.0 6.6 J	<80 <80	<5.0 <5.0	120 120	<5.0 5.4 J	<5.0 5.4 J	<5.0 <5.0	<5.0 <5.0	110 110	<10 L	<25 <25
	CTMW-02D-20170619-FD	06/19/17	PME5	<50 <50	<5.0 <5.0	88	56	<2.5	<2.5	12,000	<5.0 <5.0	<5.0	<80 F1 F2	<5.0 <5.0	290	5.4 J	5.4 J <5.0	<5.0 <5.0	<5.0 <5.0	150	<10 F1 L	<25 <25
	CTMW-02D-20170719	08/24/17	PME6	<50	<5.0	48	66	<2.5	<2.5	15,000	<5.0	<5.0	<80	<5.0	400	9.4 J	7.8 J	<5.0	<5.0	130	<10 L F1	33 J
	CTMW-02D-20170920	09/20/17	PME7	<25	<2.5	55	57	<1.3	<1.3	13,000	<2.5	3.0 J	60 J B	<2.5	380	6.9 J	4.9 J	<2.5	<2.5	150	<5.0 L F1	<13
	CTMW-02D-20171003	10/03/17	PME8	<25	<2.5	47	54	<1.3	<1.3	14,000	<2.5	16	<40	<2.5	320	7.3 J	3.4 J	<2.5	<2.5	140	<5.0	39 J
	CTMW-03S-20170405	04/05/17	Baseline	<50	<5.0	120	29	<2.5	<2.5	13,000	<5.0	<5.0	<800	<5.0	9.1 J	<5.0	<5.0	<5.0	<5.0	27	<100	<25
	CTMW-03S-20170505	05/05/17	PME1	26 J B	<2.5	97	31	<1.3	<1.3	13,000	<2.5	<2.5	<8.0	<2.5	60	3.1 J	4.9 J	<2.5	<2.5	27	<100	<13
	CTMW-03S-20170517	05/17/17	PME2	30 J	<2.5	110	33	<1.3	<1.3	14,000	<2.5	<2.5	100	<2.5	68	3.3 J	3.9 J	<2.5	<2.5	31	<200	22 J
	CTMW-03S-20170601	06/01/17	PME3	<50	<5.0	140	45	<2.5	<2.5	17,000	<5.0	<5.0	<80	<5.0	87	<5.0	<5.0	<5.0	<5.0	43	<10	<25
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	63 J	<5.0	160	51	<2.5	<2.5	4,800	<5.0	<5.0	<80	<5.0	320	10 J	<5.0	<5.0	<5.0	110	<10	<25
	CTMW-03S-20170718	07/18/17	PME5	<25	<2.5	130	43	<1.3	<1.3	16,000	<2.5	<2.5	<40	<2.5	240	4.9 J	<2.5	<2.5	<2.5	47	<5.0 L	<13
	CTMW-03S-20170823	08/23/17	PME6	9.2 J	0.51 J	180	61	<0.25	<0.25	4,600	3.1	4.0	36	<0.50	520	7.2	3.0	0.56 J	<0.50	98	<1.0 L F1 F2	8.1 J
	CTMW-03S-20170921	09/21/17	PME7	<25	<2.5	110	43	<1.3	<1.3	14,000	<2.5	4.9 J	<40	<2.5	330	4.6 J	8.6 J	57 F1 F2	<2.5	44	<5.0 L F1	<13
	CTMW-03S-20171003	10/03/17	PME8	<25	<2.5	120	42	<1.3	<1.3	13,000	<2.5	29	<40	<2.5	320	6.5 J	3.9 J	<2.5	<2.5	45	41	31 J

Notes

USEPA United States Environmental Protection Agency

ug/L Microgram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

L Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

												Dissolved N	letals by USEPA (ug/L)	Method 6020								
Well Location	Sample ID	Sample Date	Week	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
	CTMW-03D-20170406	04/06/17	Baseline	110 B F1	<5.0	100	32	<2.5	<2.5	16,000 B	<5.0	<5.0	<80	<5.0	36 B	<5.0	<5.0	<5.0	<5.0	29	<50 F1	36 J F1
	CTMW-03D-20170505	05/05/17	PME1	<25	<2.5	98	30	<1.3	<1.3	14,000	<2.5	4.3 J	9.1 J	<2.5	24	<2.5	5.8 J	12	<2.5	32	<100	<13
	CTMW-03D-20170517	05/17/17	PME2	<25	<2.5	110	31	<1.3	<1.3	15,000	<2.5	3.1 J	42 J	<2.5	22	3.9 J	5.3 J	<2.5	<2.5	36	<200	44 J F1
	CTMW-03D-20170601	06/01/17	PME3	<50	<5.0	120 F1	36	<2.5	<2.5	16,000	<5.0	<5.0	<80	<5.0	26	5.7 J	<5.0	<5.0	<5.0	40	<10 F1 L	<25
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	<50	<5.0	100	29	<2.5	<2.5	14,000	<5.0	<5.0	<80	<5.0	22	<5.0	<5.0	<5.0	<5.0	46	<10 L	<25
	CTMW-03D-20170720	07/20/17	PME5	<50	<5.0	110	31	<2.5	<2.5	15,000	<5.0	<5.0	<80	<5.0	25	<5.0	5.7 J	<5.0	<5.0	52	<10 L	<25
	CTMW-03D-20170823	08/23/17	PME6	<25	<2.5	110	31	<1.3	<1.3	14,000	<2.5	<2.5	89 J	<2.5	23	3.8 J	5.3 J	<2.5	<2.5	63	<5.0	<13
	CTMW-03D-20170921	09/21/17	PME7	<25	<2.5	100	29	<1.3	<1.3	13,000	<2.5	<2.5	<40	<2.5	25	3.1 J	6.0 J	<2.5	<2.5	49	<5.0 L	<13
	CTMW-03D-20171003	10/03/17	PME8	<25	<2.5	92	27	<1.3	<1.3	13,000	<2.5	18	<40	<2.5	22	3.3 J	3.4 J	<2.5	<2.5	48	<5.0 L	29 J
	CTMW-04S-20170405	04/05/17	Baseline	<50	<5.0	65	33	<2.5	<2.5	9,900	<5.0	<5.0	<800	<5.0	38	7.2 J	<5.0	<5.0	<5.0	34	<100	<25
	CTMW-04S-20170504	05/04/17	PME1	41	0.89 J	120	35	<0.25	<0.25	6,000	1.2	1.5 J	100	<0.50	150	4.3	3.0	<0.50	<0.50	130	<150	5.5 J
	CTMW-04S-20170517	05/17/17	PME2	20	<0.50	130	44	<0.25	<0.25	550	2.0	2.3	29	<0.50	320	6.3	2.7	<0.50	<0.50	260	17	7.1 J
OTMM 040	CTMW-04S-20170602	06/02/17	PME3	11	<0.50	170	40	<0.25	<0.25	710	1.6	3.1	54	<0.50	290	6.5	2.0	<0.50	<0.50	230	9.6	11 J
CTMW-04S	CTMW-04S-20170620 CTMW-04S-20170718	06/20/17 07/18/17	PME4 PME5	<50 <25	<5.0 <2.5	130 510	43 57	<2.5 <1.3	<2.5 <1.3	180 200	5.1 J 5.3	<5.0 <2.5	140 J B 170	<5.0 <2.5	460 1,200	130 53	<5.0 <2.5	<5.0 <2.5	<5.0 <2.5	320 480	16 J 6.4 J	26 J B <13
	CTMW-04S-20170718	08/23/17	PME6	16	2.1	440	99	<0.25	<0.25	120	1.5	1.6 J	460	<0.50	1,800	7.6	1.4 J	<0.50	<0.50	140	4.2	16 J
	CTMW-04S-20170921	09/21/17	PME7	26 B	1.3 J	370	100	<0.50	<0.50	86	<1.0	1.9 J	530	<1.0	1,400	160	1.3 J	<1.0	<1.0	40	3.8 J	5.0 J
	CTMW-04S-20171003	10/03/17	PME8	<25	<2.5	150	200	<1.3	<1.3	70	<2.5	13	62 J	<2.5	2,000	2.5 J	<2.5	<2.5	<2.5	190	<5.0	21 J
	CTMW-04D-20170405	04/05/17	Baseline	<50	<5.0	72	39	<2.5	<2.5	18,000	<5.0	<5.0	<800	<5.0	16	<5.0	<5.0	<5.0	<5.0	32	<100	<25
	CTMW-04D-20170504	05/04/17	PME1	28	<0.50	78	45	<0.25	<0.25	22,000	0.50 J	1.5 J	52	<0.50	15	3.1	3.3 F1	<0.50	<0.50	33	<150	17 J,F1
	CTMW-04D-20170517	05/17/17	PME2	<25	<2.5	92	41	<1.3	<1.3	19,000	<2.5	<2.5	71 J	<2.5	11	3.5 J	<2.5	<2.5	<2.5	33	<250	<13
	CTMW-04D-20170517-FD	05/17/17	PME2	<25	<2.5	95	43	<1.3	<1.3	20,000	<2.5	<2.5	65 J	<2.5	12	3.8 J	4.0 J	<2.5	<2.5	35	<250	<13
	CTMW-04D-20170602	06/02/17	PME3	<50	<5.0	110	49	<2.5	<2.5	22,000	<5.0	<5.0	<80	<5.0	22	5.8 J	<5.0	<5.0	<5.0	50	<10 L	<25
CTMW-04D	CTMW-04D-20170621	06/21/17	PME4	<50	<5.0	80	40	<2.5	<2.5	18,000	<5.0	<5.0	<80	<5.0	11	<5.0	<5.0	<5.0	<5.0	32	<10 L	<25
	CTMW-04D-20170718	07/18/17	PME5	<25	<2.5	120	51	<1.3	<1.3	23,000	<2.5	<2.5	<40	<2.5	14	4.8 J	3.4 J	<2.5	<2.5	42	<5.0 L	<13
	CTMW-04D-20170823	08/23/17	PME6	<25	<2.5	93	41	<1.3	<1.3	18,000	<2.5	<2.5	100	<2.5	14	4.5 J	5.6 J	<2.5	<2.5	34	<5.0	<13
	CTMW-04D-20170823-FD	08/23/17	PME6	<25	<2.5	90	40	<1.3	<1.3	17,000	<2.5	<2.5	100	<2.5	21	4.7 J	5.1 J	<2.5	<2.5	32	<5.0 L	<13
	CTMW-04D-20170920	09/20/17	PME7	<25	<2.5	110	40	<1.3	<1.3	17,000	<2.5	<2.5	90 J B	<2.5	11	4.8 J	5.2 J	<2.5	<2.5	43	<5.0 L	<13
	CTMW-04D-20171003	10/03/17	PME8	55	<2.5	110	40	<1.3	<1.3	17,000	<2.5	8.6 J	<40	<2.5	9.4	4.0 J	3.2 J	<2.5	<2.5	45	<5.0	19 J
	CTMW-05S-20170621	06/21/17	PME4	<50	<5.0	88	50	<2.5	<2.5	4,900	<5.0	<5.0	<80	<5.0	190	<5.0	<5.0	<5.0	<5.0	170	<10	<25
OTMM 050	CTMW-05S-20170717	07/17/17	PME5	<25	<2.5	130	54	<1.3	<1.3	3,000	<2.5	<2.5	<40	<2.5	260	5.5 J	<2.5	<2.5	<2.5	250	<5.0 L	<13
CTMW-05S	CTMW-05S-20170822	08/22/17	PME6	120 <10	<0.50	110	56	<0.25	<0.25	3,200	1.2	1.9 J	80	<0.50	210	4.1	4.1	<0.50	<0.50	160	<1.0	5.5 J
	CTMW-05S-20170919 CTMW-05S-20171004	09/19/17 10/04/17	PME7 PME8		<1.0 <0.50	140	53 49	<0.50 <0.25	<1.3 <0.25	2,100	1.3 J	2.8 J 85	<16	<1.0	230	4.9 2.6	4.2 3.3	<1.0 <0.50	<1.0 <0.50	170	<10 20	9.3 J 74
	CTMW-055-20171004 CTMW-05D-20170621	06/21/17	PME4	530 <50	<5.0	110 85	34	<2.5	<2.5	6,500 14,000	0.52 J <5.0	<5.0	17 J <80	8.0 <5.0	190 16	< 5.0	3.3 <5.0	<5.0	<5.0	110 40	<10	<25
1	CTMW-05D-20170621-FD	06/21/17	PME4	<50 <50	<5.0	94	33	<2.5	<2.5	14,000	<5.0	<5.0	<80	<5.0	19	<5.0	18 J	<5.0	<5.0	37	<10 L	<25
	CTMW-05D-20170718	07/18/17	PME5	<25 F1	<2.5 F1	130	46	<1.3	<1.3	19,000	<2.5 F1	<2.5	<40	<2.5	21	3.5 J	6.1 J	<2.5	<2.5	57 F1	<5.0 L F1	<13 F1
CTMW-05D	CTMW-05D-20170822	08/22/17	PME6	92 J	<5.0	110	34	<2.5	<2.5	14,000	<5.0	<5.0	130 J	<5.0	12	5.2 J	6.6 J	<5.0	<5.0	52	<10	<25
	CTMW-05D-20170919	09/19/17	PME7	<25	<2.5	120	36	<1.3	<5.0	14,000	<2.5	<2.5	<40	<2.5	21	3.9 J	5.6 J	<2.5	<2.5	56	<100	<13
	CTMW-05D-20171004	10/04/17	PME8	<25	3.6 J	110	34	<1.3	<1.3	13,000	<2.5	16 F1	<40	<2.5	17	<2.5	5.2 J	<2.5	<2.5	60	21	25 J F2 F1
	CTMW-06S-20170621	06/21/17	PME4	56 J B	<5.0	190	210	<2.5	<2.5	160	<5.0	<5.0	110 J	<5.0	1,600	15 J	8.3 J	<5.0	<5.0	450	<10	<25
	CTMW-06S-20170717	07/17/17	PME5	<25	4.0 J	660	1,100	<1.3	<1.3	120	3.1 J	<2.5	<40	<2.5	4,300	34	<2.5	<2.5	<2.5	370	11	<13
CTMW-06S	CTMW-06S-20170822	08/22/17	PME6	58	1.6 J	120	1,400	<0.25	<0.25	62	3.9	1.7 J	410	<0.50	4,700	11	1.2 J	<0.50	<0.50	19	2.7	5.9 J
	CTMW-06S-20170919	09/19/17	PME7	43	1.9 J	190	1,200	<0.50	<0.50	53	1.3 J	2.9 J	210 B	<1.0	5,400	8.2	1.1 J	<1.0	<1.0	1.4 J	2.0 J	16 J
	CTMW-06S-20171004	10/04/17	PME8	7.2 J	2.1	210	920	<0.25	<0.25	47	<0.50	<0.50	100	<0.50	5,600	4.1	0.82 J	<0.50	<0.50	1.3	1.4 J	3.3 J
	CTMW-06D-20170622	06/22/17	PME4	<10	<1.0	74	37	<0.50	<0.50	18,000	<1.0	1.9 J	96 J B	<1.0	50	3.6 J	3.4 J	<1.0	<1.0	74	<10 L	7.2 J B
	CTMW-06D-20170717	07/17/17	PME5	<25	<2.5	110	46	<1.3	<1.3	22,000	<2.5	<2.5	<40	<2.5	61	4.7 J	2.9 J	<2.5	<2.5	110	<5.0 L	<13
	CTMW-06D-20170717-FD	07/17/17	PME5	<25	<2.5	110	46	<1.3	<1.3	23,000	<2.5	3.8 J	<40	<2.5	55	5.4 J	3.8 J	<2.5	<2.5	110	<5.0 L	<13
CTMW-06D	CMTW-06D-20170822	08/22/17	PME6	<50 F1	<5.0	90	40	<2.5	<2.5	15,000	<5.0	<5.0	<80	<5.0	92	8.0 J	7.4 J	<5.0	<5.0	130	<10	<25
	CMTW-06D-20170919	09/19/17	PME7	<25 F1 F2	<2.5	99	46	<1.3	<5.0	13,000	<2.5	<2.5	<40	<2.5	140	5.8 J	11	36 F1 B	<2.5	160	<100	<13
1	CTMW-06D-20170919-FD	09/19/17	PME7 PME8	<25	<2.5	100	46	<1.3	<5.0	13,000	<2.5	<2.5	<40 <40	<2.5	140	5.7 J	5.1 J	<2.5	<2.5	160	<100	<13
	CTMW-06D-20171004 CTMW-06D-20171004-FD	10/04/17 10/04/17	PME8	<25 35 J	<2.5 <2.5	110 120	64 64	<1.3 <1.3	<1.3 <1.3	12,000 12,000	<2.5 <2.5	<2.5 <2.5	<40 <40	<2.5 <2.5	180 180	2.7 J 2.6 J	4.1 J 4.3 J	<2.5 <2.5	<2.5 <2.5	170 180	19 20	<13 <13
	G1WW-00D-201/1004-FD	10/04/17	FIVIEO	39 J	~2.5	120	04	\1.3	~1.3	12,000	~2.3	~2.5	\ 4 U	~2.5	100	2.0 J	4.3 J	~2.5	~2.5	100	20	~13

Notes:

USEPA United States Environmental Protection Agency

ug/L Microgram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

J Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

												'A Method 8260B g/L)							
Well Location	Sample ID	Sample Date	Week	Acetone	Benzene	Bromodichloro methane	Bromoform	2-Butanone (MEK)	Carbon Tetrachloride	Chloroform	1,2-Dichlor obenzene	1,3-Dichlor obenzene	1,4-Dichlor obenzene	Hexachloro- butadiene	Methylene Chloride	Methyl-t-Butyl Ether (MTBE)	Tetrachloro- ethene	1,2,3- Trichlorobenze ne	Trichloro- ethene
	CTMW-01S-20170404	04/04/17	Baseline	<100	<2.5	<2.5	<4.0	<25	<2.5	850	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-01S-20170503	05/03/17	PME1	2,800	<2.5	<2.5	<4.0	360	<2.5	420	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-01S-20170516	05/16/17	PME2	<1,000	<25	<25	<40	1,200	<25	340	<25	<25	<25	<25	<88	<25	<25	<40	<25
	CTMW-01S-20170531	05/31/17	PME3	<250	<6.3	<6.3	<10	1,300	<6.3	230	<6.3	<6.3	<6.3	<6.3	45 J,B	<6.3	<6.3	<10	<6.3
CTMW-01S	CTMW-01S-20170619	06/19/17	PME4	300 J	<6.3	<6.3	<10	3,500	<6.3	140	<6.3	<6.3	<6.3	<6.3	27 J	<6.3	<6.3	<10	<6.3
	CTMW-01S-20170720	07/20/17	PME5	<400	<10	<10	<16	2,400	<10	130	<10	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-01S-20170824	08/24/17	PME6	630 J	<13	<13	<20	6,400	<13	86	<13	<13	<13	<13	78 J	<13	<13	<20	<13
	CTMW-01S-20170920	09/20/17	PME7	750 J	<13	<13	<20	7,200	<13	19 J	<13	<13	<13	<13	<44	<13	<13	<20	<13
	CTMW-01S-20171003	10/03/17	PME8	<1,000	<25	<25	<40	11,000	<25	<25	<25	<25	<25	<25	140 J	<25	<25	<40	<25
	CTMW-01D-20170403	04/03/17	Baseline	<200	<5.0	<5.0	<8.0	<50	<5.0	1,800	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-01D-20170503	05/03/17	PME1	<250	<6.3	<6.3	<10	<63	<6.3	1,700	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-01D-20170516	05/16/17	PME2	<400	<10	<10	<16	<100	<10	1,700	<10	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-01D-20170531	05/31/17	PME3	<250	<6.3	<6.3	<10	<63	<6.3	1,800	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
OTMIN 04D	CTMW-01D-20170619	06/19/17	PME4	<250	<6.3	<6.3	<10	<63	<6.3	1,600	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
CTMW-01D	CTMW-01D-20170720	07/20/17	PME5	<250	<6.3	<6.3	<10	<63	<6.3	1,700	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-01D-20170720-FD	07/20/17	PME5	<250	<6.3	<6.3	<10	<63	<6.3	1,700	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-01D-20170824	08/24/17	PME6	320 J	<5.0	<5.0	<8.0	150	<5.0	1,500	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-01D-20170920	09/20/17	PME7	440	<5.0	<5.0	<8.0	360	<5.0	1,500	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-01D-20171003	10/03/17	PME8	560 J	<10	<10	<16	440	<10	1,300	<10	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-02S-20170405	04/05/17	Baseline	<250	<6.3	<6.3	<10	<63	<6.3	950	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02S-20170504	05/04/17	PME1	420	0.37 J	<2.5	<0.40	38	<0.25	620	<0.25	<0.25	<0.25	<0.25	<0.88	0.87	0.28 J	0.57 J	1.2
	CTMW-02S-20170516	05/16/17	PME2	<100	<2.5	<2.5	<4.0	<25	<2.5	420	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-02S-20170601	06/01/17	PME3	47 J	<0.63	<0.63	<1.0	<6.3	<0.63	520	<0.63	<0.63	<0.63	<0.63	4.3 J,B	<0.63	<0.63	<1.0	<0.63
CTMW-02S	CTMW-02S-20170620	06/20/17	PME4	260	1.0 J	<0.63	<1.0	2,000	<0.63	210	<0.63	< 0.63	<0.63	<0.63	24	<0.63	<0.63	3.0	<0.63
	CTMW-02S-20170719	07/19/17	PME5	<250	<6.3	<6.3	<10	1,600	<6.3	180	<6.3	<6.3	<6.3	<6.3	41 J	<6.3	<6.3	<10	<6.3
	Not Analyzed	08/24/17	PME6						II.		Well Dry; Un	able to sample				1	l .		
	CTMW-02S-20170920	09/20/17	PME7	<250	<6.3	<6.3	<10	1,500	<6.3	78	<6.3	<6.3	<6.3	<6.3	25 J	<6.3	<6.3	<10	<6.3
	CTMW-02S-20171003	10/03/17	PME8	<200	<5.0	<5.0	<8.0	1,200	<5.0	13	<5.0	<5.0	<5.0	<5.0	27 J	<5.0	<5.0	<8.0	<5.0
	CTMW-02D-20170404	04/04/17	Baseline	<250	<6.3	<6.3	<10	<63	<6.3	1,500	9.4 J	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02D-20170404-FD	04/04/17	Baseline	<250	<6.3	<6.3	<10	<63	<6.3	1,500	9.4 J	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02D-20170503	05/03/17	PME1	<250	<6.3	<6.3	<10	<63	<6.3	1,500	13	<6.3	6.5 J	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02D-20170503-FD	05/03/17	PME1	<250	<6.3	<6.3	<10	<63	<6.3	1,500	14	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02D-20170517	05/17/17	PME2	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	17	<5.0	6.7 J	<5.0	29 J	<5.0	<5.0	<8.0	<5.0
	CTMW-02D-20170601	06/01/17	PME3	<400	<10	<10	<16	<100	<10	1,900	19 J	<10	<10	<10	38 J	<10	<10	<16	<10
CTMW-02D	CTMW-02D-20170601-FD	06/01/17	PME3	<400	<10	<10	<16	<100	<10	1,800	15	<10	7.2 J	<10	22 J	<10	<10	<16	<10
	CTMW-02D-20170619	06/19/17	PME4	<400	<10	<10	<16	<100	<10	1,500	16 J	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-02D-20170619-FD	06/19/17	PME4	<200	<5.0	<5.0	<8.0	82 J	<5.0	1,600	16	<5.0	7.9 J	<5.0	<18	<5.0	<5.0	<8.0	<5.0
1	CTMW-02D-20170719	07/19/17	PME5	<250	<6.3	<6.3	<10	290	<6.3	1,600	12 J	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-02D-20170824	08/24/17	PME6	<200	<5.0	<5.0	<8.0	<50	<5.0	1,400	18	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-02D-20170920	09/20/17	PME7	<100	<2.5	<2.5	<4.0	<25	<2.5	1,500	15	<2.5	6.4	<5.0	<8.8	<2.5	<4.0	<4.0	<2.5
	CTMW-02D-20171003	10/03/17	PME8	<400	<10	<10	<16	<100	<10	1,500	22	<10	10 J	<10	<35	<10	<10	<16	<10
	CTMW-03S-20170405	04/05/17	Baseline	<200	<5.0	<5.0	<8.0	<50	<5.0	930	<5.0	<5.0	<5.0	<5.0	21 J	<5.0	<5.0	<8.0	<5.0
	CTMW-03S-20170505	05/05/17	PME1	<200	<5.0	<5.0	<8.0	<50	<5.0	1,100	<5.0	<5.0	<5.0	<5.0	18 J	<5.0	<5.0	<8.0	<5.0
	CTMW-03S-20170517	05/17/17	PME2	<100	<2.5	<2.5	<4.0	<25	<2.5	970	<2.5	<2.5	<2.5	<2.5	17 J	<2.5	<2.5	<4.0	<2.5
	CTMW-03S-20170601	06/01/17	PME3	<200	<5.0	<5.0	<8.0	<50	<5.0	1,200	<5.0	<5.0	<5.0	<5.0	18 J	<5.0	<5.0	<8.0	<5.0
CTMW-03S	CTMW-03S-20170620	06/20/17	PME4	250	<2.5	<2.5	<4.0	690	<2.5	920	<2.5	<2.5	<2.5	<2.5	16 J	<2.5	<2.5	<4.0	<2.5
	CTMW-03S-20170718	07/18/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-03S-20170823	08/23/17	PME6	<100	<2.5	<2.5	<4.0	280	<2.5	900	<2.5	<2.5	<2.5	<2.5	19 J	<2.5	<2.5	<4.0	<2.5
	CTMW-03S-20170921	09/21/17	PME7	<50	<1.3	<1.3	<2.0	<13	<1.3	510	<1.3	<1.3	<1.3	<1.3	<4.4	<1.3	<1.3	<2.0	<1.3
	CTMW-03S-20171003	10/03/17	PME8	<200	<5.0	<5.0	<8.0	<50	<5.0	700	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	1 : ::==:::==	1			1					1		1	***	1		1			

Notes:

USEPA United States Environmental Protection Agency

g/L Microgram per liter

B Compound was found in the blank and the sample

Concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

Denotes a negative instrument reading had an absolute value greater than the reporting limit



Central Retention Basin

												A Method 8260B g/L)							
Well Location	Sample ID	Sample Date	Week	Acetone	Benzene	Bromodichloro methane	Bromoform	2-Butanone (MEK)	Carbon Tetrachloride	Chloroform	1,2.Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Hexachloro- butadiene	Methylene Chloride	Methyl t -Butyl Ether (MTBE)	Tetrachloro- ethene	1,2,3- Trichlorobenze ne	Trichloro- ethene
	CTMW-03D-20170406	04/06/17	Baseline	<250	<6.3	<6.3	<10	<63	<6.3	880	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-03D-20170505	05/05/17	PME1	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	19 J	<5.0	<5.0	<8.0	<5.0
	CTMW-03D-20170517	05/17/17	PME2	<200	<5.0	<5.0	<8.0	<50	<5.0	1,100	<5.0	<5.0	<5.0	<5.0	26 J	<5.0	<5.0	<8.0	<5.0
	CTMW-03D-20170601	06/01/17	PME3	<100	<2.5	<2.5	<4.0	<25	<2.5	1,400	<2.5	<2.5	<2.5	<2.5	11 J	<2.5	<2.5	<4.0	2.5 J
CTMW-03D	CTMW-03D-20170620	06/20/17	PME4	<200	<5.0	<5.0	<8.0	<50	<5.0	1,200	<5.0	<5.0	<5.0	<5.0	29 J	<5.0	<5.0	<8.0	<5.0
	CTMW-03D-20170720	07/20/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-03D-20170823	08/23/17	PME6	<50	<1.3	<1.3	<2.0	<13	<1.3	1,100	<1.3	<1.3	<1.3	<1.3	<4.4	<1.3	<1.3	<2.0	3.0
-	CTMW-03D-20170921 CTMW-03D-20171003	09/21/17 10/03/17	PME7 PME8	<10 <400	<0.25 <10	<0.25 <10	<0.40 <16	<2.5 <100	0.58 <10	1,100 1,000	<0.25 <10	<0.25 <10	<0.25 <10	<0.25 <10	<0.88 <35	1.2 <10	0.37 J <10	<0.40 <16	2.9 <10
	CTMW-04S-20171005	04/05/17	Baseline	<10	<0.25	<0.25	0.82 J	<2.5	0.41 J	720	<0.25	<0.25	<0.25	0.58	<0.88	0.86	0.26 J	<0.40	2.0
ŀ	CTMW-04S-20170504	05/04/17	PME1	220	<2.5	<2.5	<4.0	<25	<2.5	810	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
ŀ	CTMW-04S-20170517	05/17/17	PME2	1,800	<2.5	<2.5	<4.0	1,000	<2.5	640	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-04S-20170602	06/02/17	PME3	860	<2.5	<2.5	<4.0	370	<2.5	610	<2.5	<2.5	<2.5	<2.5	9.7 J	<2.5	<2.5	<4.0	<2.5
CTMW-04S	CTMW-04S-20170620	06/20/17	PME4	1,900	0.46 J	<0.25	<0.40	670	<0.25	590	<0.25	<0.25	<0.25	0.36 J	2.6	0.81	<0.25	<0.40	0.92
l	CTMW-04S-20170718	07/18/17	PME5	920	<2.5	<2.5	<4.0	650	<2.5	620	<2.5	<2.5	<2.5	<2.5	15 J	<2.5	<2.5	<4.0	<2.5
	CTMW-04S-20170823	08/23/17	PME6	1,200	<1.3	<1.3	<2.0	1,300	<1.3	520	<1.3	<1.3	<1.3	<1.3	24	<1.3	<1.3	<2.0	<1.3
	CTMW-04S-20170921	09/21/17	PME7	770	<0.25	<0.25	<0.40	1,900	<0.25	67	<0.25	<0.25	<0.25	<0.25	1.7 J	0.49 J	<0.25	<0.40	<0.25
	CTMW-04S-20171003	10/03/17	PME8	89	<0.25	<0.25	<0.40	140	<0.25	48	<0.25	<0.25	<0.25	<0.25	4.3	0.89	<0.25	<0.40	<0.25
	CTMW-04D-20170405	04/05/17	Baseline	<50	<1.3	<1.3	<2.0	<13	<1.3	1,600	5.1	<1.3	3.7	<1.3	<4.4	<1.3	<1.3	<2.0	<1.3
	CTMW-04D-20170504	05/04/17	PME1	<10	<0.25	<0.25	0.81 J	<2.5	0.46 J	1,400	2.8	0.34 J	1.9	<0.25	<0.88	0.85	0.36 J	<0.40	1.1
	CTMW-04D-20170517	05/17/17	PME2	<200	<5.0	<5.0	<8.0	<50	<5.0	1,600	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-04D-20170517-FD	05/17/17	PME2	<200	<5.0	<5.0	<8.0	<50	<5.0	1,600	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-04D-20170602	06/02/17	PME3	<200	<5.0	<5.0	<8.0	<50	<5.0	1,600	<5.0	<5.0	<5.0	<5.0	24 J	<5.0	<5.0	<8.0	<5.0
CTMW-04D	CTMW-04D-20170621	06/21/17	PME4	<250	<6.3	<6.3	<10	<63	<6.3	1,600	<6.3	<6.3	<6.3	<6.3	34 J	<6.3	<6.3	<10	<6.3
	CTMW-04D-20170718	07/18/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,700	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
-	CTMW-04D-20170823 CTMW-04D-20170823-FD	08/23/17 08/23/17	PME6 PME6	<200 <200	<5.0 <5.0	<5.0 <5.0	<8.0 <5.0	<50 <50	<5.0 <5.0	1,700 1,700	<5.0 <5.0	<5.0 <5.0	<5.0 <5.0	<5.0 <5.0	24 J 27 J	<5.0 <5.0	<5.0 <5.0	<8.0 <8.0	<5.0 <5.0
	CTMW-04D-20170823-FD	09/20/17	PME7	<200	<5.0	<5.0	<5.0	<50	<5.0	1,400	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
ŀ	CTMW-04D-20171003	10/03/17	PME8	<400	<10	<10	<16	<100	<10	1,300	<10	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-05S-20170621	06/21/17	PME4	<100	<2.5	<2.5	<4.0	<25	<2.5	960	<2.5	<2.5	<2.5	<2.5	14 J	<2.5	<2.5	<4.0	<2.5
	CTMW-05S-20170717	07/17/17	PME5	<100	<2.5	<2.5	<4.0	<25	<2.5	1,100	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
CTMW-05S	CTMW-05S-20170822	08/22/17	PME6	<100	<2.5	<2.5	<4.0	<25	<2.5	750	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-05S-20170919	09/19/17	PME7	<50	<1.3	<1.3	<1.3	<1.3	<1.3	410	<1.3	<1.3	<1.3	<1.3	<4.4	<1.3	<1.3	<2.0	<1.3
	CTMW-05S-20171004	10/04/17	PME8	<100	<2.5	<2.5	<4.0	<25	<2.5	630	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-05D-20170621	06/21/17	PME4	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	30 J	<5.0	<5.0	<8.0	<5.0
	CTMW-05D-20170621-FD	06/21/17	PME4	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	35 J	<5.0	<5.0	<8.0	<5.0
CTMW-05D	CTMW-05D-20170718	07/18/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,300	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-05D-20170822	08/22/17	PME6	<250	<6.3	<6.3	<10	<63	<6.3	1,200	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-05D-20170919	09/19/17	PME7	<100	<2.5	<2.5	<4.0	<25	<2.5	630	<2.5	<2.5	<2.5	<2.5	<8.8	<2.5	<2.5	<4.0	<2.5
	CTMW-05D-20171004	10/04/17	PME8	<250	<6.3	<6.3	<10	<63	<6.3	1,000	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
-	CTMW-06S-20170621	06/21/17 07/17/17	PME4	1,700	<2.5	<2.5	<4.0	730 2,800	<2.5	670	<2.5	<2.5	<2.5	<2.5	18 J <35	<2.5	<2.5	<4.0 <16	<2.5
CTMW-06S	CTMW-06S-20170717 CTMW-06S-20170822	08/22/17	PME5 PME6	1,400 1,400	<10 <5.0	<10 <5.0	<16 <8.0	3,200	<10 <5.0	610 320	<10 <5.0	<10 <5.0	<10 <5.0	<10 <5.0	30 J	<10 <5.0	<10 <5.0	<8.0	<10 <5.0
51 mm-000	CTMW-06S-20170822	09/19/17	PME7	780	<5.0 <5.0	<5.0	<8.0	3,700	<5.0 <5.0	170	<5.0 <5.0	<5.0 <5.0	<5.0 <5.0	<5.0 <5.0	41	<5.0 <5.0	<5.0	<8.0	<5.0
	CTMW-06S-20171004	10/04/17	PME8	620	2.6 J	<2.5	<4.0	4,000	<2.5	120	<2.5	<2.5	<2.5	<2.5	13 J	<2.5	<2.5	<4.0	<2.5
	CTMW-06D-20170622	06/22/17	PME4	<400	<10	<10	<16	<100	<10	1,500	<10	<10	<10	<10	<35	<10	<10	<16	<10
	CTMW-06D-20170717	07/17/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,700	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-06D-20170717-FD	07/17/17	PME5	<200	<5.0	<5.0	<8.0	<50	<5.0	1,700	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
OTMAN COD	CMTW-06D-20170822	08/22/17	PME6	<250	<6.3	<6.3	<10	<6.3	<63	1,400	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
CTMW-06D	CMTW-06D-20170919	09/19/17	PME7	<200	<5.0	<5.0	<8.0	<50	<5.0	1,200	<5.0	<5.0	<5.0	<5.0	<18	<5.0	<5.0	<8.0	<5.0
	CTMW-06D-20170919-FD	09/19/17	PME7	250	<0.25	0.27 J	<0.40	150	0.54	1,000	3.6	0.32 J	1.0	0.45 J	1.1 J	0.68	0.44 J	0.72 J	1.0
	CTMW-06D-20171004	10/04/17	PME8	<250	<6.3	<6.3	<10	<63	<6.3	1,200	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3
	CTMW-06D-20171004-FD	10/04/17	PME8	<250	<6.3	<6.3	<10	<63	<6.3	1,200	<6.3	<6.3	<6.3	<6.3	<22	<6.3	<6.3	<10	<6.3

Notes:

USEPA United States Environmental Protection Agency

ug/L Microgram per liter

B Compound was found in the blank and the sample

Denotes concentration is less than the laboratory method detection limit indicated

Denotes concentration is less than the laboratory reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value

F1 MS and / or MSD Recovery is outside acceptance limits

F2 MS/MSD RPD exceeds control limits

Denotes a negative instrument reading had an absolute value greater than the reporting limit



Chemical Reduction Study

					AF AICa						
Well ID	Sample ID	Sample Date	Perchlorate by USEPA Method	Hexavalent Chromium by USEPA Method	60	USEPA Method 10B g/L)	Disinfection B USEPA Met (mg		Nitrate as N by USEPA Method	General Ch (mg/	
Well ID	Cumple 12	Gample Bate	314.0 (mg/L)	7199 (mg/L)	Chromium	Manganese	Chlorate	Chlorite	300.0 (mg/L)	Total Dissolved Solids (TDS)	Total Sulfide
	UFMW-01S-20160809	08/09/16	950	<0.000025	0.035						
UFMW-01S	UFMW-01S-20170817	08/17/17	92	0.00075	0.0053		1.2	<0.1	72	3,200	<0.027
	Not Sampled	10/06/17				•	Well is dry		•		
	UFMW-01I-20160809	08/09/16	920	0.019	0.021						
UFMW-01I	UFMW-01I-20160809-FD	08/09/16	1,100	0.020	0.021						
OFWW-011	UFMW-01I-20170816	08/16/17	150	0.000078	<0.0025		1.8	<0.05	23	2,400	<0.027
	UFMW-01I-20171006	10/06/17	160	<0.00008 J			2.0	<0.5	25	2,300	<0.027
	UFMW-01D-20160809	08/09/16	1,700	0.015	0.013						
UFMW-01D	UFMW-01D-20170816	08/16/17	560	0.016	0.018		6.1	<0.05	67	4,000	<0.027
	UFMW-01D-20171005	10/05/17	530	0.021			6.2	<0.2	56	3,300	<0.050
	UFMW-02S-20160810	08/10/16	1,200	<0.000025	0.18						
UFMW-02S	Not Sampled	08/17/17				Less Than 1" of W	ater Observed in V	Vell; Unable to Sa	mple.		
	Not Sampled	10/06/17					Well is dry				
	UFMW-02I-20160810	08/10/16	1,900	0.018	0.018						
UFMW-02I	UFMW-02I-20170817	08/17/17	430	0.0052	0.0059		3.5	<0.1	54	3,200	<0.027
	UFMW-02I-20171006	10/06/17	370	0.0042			2.9	<0.5	43	3,000	<0.027
	UFMW-02D-20160810	08/10/16	2,900	0.012	0.014						
UFMW-02D	UFMW-02D-20170817	08/17/17	980	0.013	0.015		6.2	<0.05	82	4,200	<0.027
	UFMW-02D-20171006	10/06/17	950	0.013			6.8	<0.5	80	4,500	<0.027
	Not Sampled	08/08/16					Well is dry				•
UFMW-03S	Not Sampled	08/15/17					Well is dry				
	Not Sampled	10/06/17					Well is dry				
	UFMW-03I-20160808	08/08/16	1,400	0.018	0.018						
LIEBANA/ OO'	UFMW-03I-20170817	08/17/17	160	0.0013 J	0.0033 J		2.2	<0.05	27	2,900	<0.027
UFMW-03I	UFMW-03I-20170817-FD	08/17/17	160	0.0014 J	0.0043 J		2.4	<0.05	27	2,900	<0.027
	UFMW-03I-20171006	10/06/17	230	0.0024			3.6	<0.5	33	2,900	<0.027
	UFMW-03D-20160808	08/08/16	2,200	0.029	0.033						
UFMW-03D	UFMW-3D-20170817	08/17/17	610	0.011	0.0140		4.9	<0.05	45	3,400	<0.027
	UFMW-03D-20171006	10/06/17	480	0.0083			4.6	<0.5	40	2,900	<0.027

Notes:

USEPA	United States Environmental Protection Agency
mg/L	Milligram per liter
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
F1	MS and/or MSD Recovery is outside acceptance limits.
Н	Compound was found in the blank and sample
С	Matrix Spike and /or Matrix Spike Duplicate recovery is outside acceptance limits.
_	Not Analyzed



Well ID	Sample ID	Sample Date	Perchlorate by USEPA Method	Hexavalent Chromium by USEPA Method	60 ⁻	USEPA Method 10B g/L)		y-Products by hod 300.1B g/L)	Nitrate as N by USEPA Method	General Ch (mg/l	
Well ID	Campions	Cample Bate	314.0 (mg/L)	7199 (mg/L)	Chromium	Manganese	Chlorate	Chlorite	300.0 (mg/L)	Total Dissolved Solids (TDS)	Total Sulfide
	UFMW-04S-20160819	08/19/16	220	0.0066	0.037						
UFMW-04S	UFMW-04S-20170816	08/16/17	130	0.011	0.018		0.18	<0.05	55	3,400	<0.027
	UFMW-04S-20171005	10/05/17	21	0.002			0.86	<0.5	14	3,800	<0.027
	UFMW-04I-20160818	08/18/16	400	0.026	0.039						
LIEBANA/ O.41	UFMW-04I-20160818-FD	08/18/16	390	0.026	0.044						
UFMW-04I	UFMW-04I-20170816	08/16/17	240	0.031	0.034		10.0	<0.05	22	3,200	<0.027
	UFMW-04I-20171005	10/05/17	31	0.0085			1.5	<0.5	6.2	3,400	<0.027
	UFMW-04D-20160818	08/18/16	870	0.027	0.028						
	UFMW-4D-20170816	08/16/17	670	0.036	0.038		12.0	<0.05	17	3,900	<0.027
UFMW-04D	UFMW-04D-20171005	10/05/17	220	0.029			7.0	<0.5	14	3,800	<0.027
	UFMW-04D-20171005-FD	10/05/17	210	0.029			7.0	<0.5	18	3,700	<0.027
	UFMW-05S-20160819	08/19/16	610	<0.000025	0.16 c						
UFMW-05S	UFMW-05S-20170816	08/16/17	290	0.006	0.021		11.0	<0.05	87	4,200	<0.027
	UFMW-05S-20171005	10/05/17	230	0.0011 J			16.0	<0.5	30	6,300	<0.027
	UFMW-05I-20160823	08/23/16	610	0.011	0.014						
UFMW-05I	UFMW-05-20170816	08/16/17	350	0.013	0.018		8.7	<0.05	47	3,500	<0.027
	UFMW-05I-20171004	10/04/17	230	0.014			5.1	<1	30	3,800	<0.027
	UFMW-05D-20160822	08/22/16	1,400	0.0058	0.0066						
UFMW-05D	UFMW-5D-20170815	08/15/17	1,400	0.022	0.024		11.0	<0.05	35	4,600	<0.027
	UFMW-05D-20171004	10/04/17	630	0.018			10.0	<1	29	4,700	<0.027
	UFMW-06S-20160819	08/19/16	730 c	0.028	0.031						
UFMW-06S	UFMW-06S-20170815	08/15/17	490	0.0045	0.049		8.9	<0.05	78	3,600	<0.027
	UFMW-06S-20171005	10/05/17	360	<0.013			1.2	<0.1	59	4,300	<0.027 F1
	UFMW-06I-20160822	08/22/16	700	0.027	0.028						
	UFMW-06I-20170815	08/15/17	610	0.016	0.017		8.7	<0.05	79 H	3,400	<0.027
UFMW-06I	UFMW-06I-20170815-DUP	08/15/17	640	0.016 H	0.018		8.9	<0.05	77 H	3,400	<0.027
	UFMW-06I-20171004	10/04/17	340	0.0082			12.0	<1	59	4,300	<0.027
	UFMW-06D-20160822	08/22/16	1,700	0.016	0.020						
UFMW-06D	UFMW-06D-20170815	08/15/17	1,300 F1	0.026 H	0.025		11.0	<0.1	49 H	3,600	<0.027 F1
	UFMW-06D-20171004	10/04/17	1,300	0.027			9.9	<1	55	3,700	<0.027

Notes:

JSEPA	United States Environmental Protection Agency
mg/L	Milligram per liter
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1	MS and/or MSD Recovery is outside acceptance limits.
Н	Compound was found in the blank and sample
С	Matrix Spike and /or Matrix Spike Duplicate recovery is outside acceptance limits.



Well ID	Sample ID	Sample Date							Diss	olved Metals by (μց		l 6020						
			Aluminum	Antimony	Arsenic	Barium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Selenium	Thallium	Uranium	Vanadium	Zinc
	UFMW-01S-20160809	08/09/16				-		-			-				-			
UFMW-01S	UFMW-01S-20170817	08/17/17				-					1							
	Not Sampled	10/06/17								Well	is dry							
	UFMW-01I-20160809	08/09/16				-					1							
UFMW-01I	UFMW-01I-20160809-FD	08/09/16				-					1							
OFWW-011	UFMW-01I-20170816	08/16/17																
	UFMW-01I-20171006	10/06/17	5.9 J, B	<0.50	160	16	0.99 J	<0.50	1.4 J	320	<0.50	10	1.8 J, B	1.8 J	<0.50	28	24	3.7 J
	UFMW-01D-20160809	08/09/16									-							
UFMW-01D	UFMW-01D-20170816	08/16/17																
	UFMW-01D-20171005	10/05/17	<5.0	<0.50	120	21	18	<0.50	<0.50	<8.0	<0.50	8.9	0.75 J	2.7	0.59 J	39	16	5.7 J
	UFMW-02S-20160810	08/10/16																
UFMW-02S	Not Sampled	08/17/17							Less Than 1"	of Water Observ	ed in Well; Unat	ole to Sample.						
	Not Sampled	10/06/17								Well	is dry							
	UFMW-02I-20160810	08/10/16																
UFMW-02I	UFMW-02I-20170817	08/17/17																
	UFMW-02I-20171006	10/06/17	5.7 J B	<0.50	180	15	7.0 B	<0.50	1.7 J	<8.0	<0.50	8.9	2.0 B	1.8 J	<0.50	18	36	6.0 J
	UFMW-02D-20160810	08/10/16																
UFMW-02D	UFMW-02D-20170817	08/17/17																
	UFMW-02D-20171006	10/06/17	<5.0	<0.50	61	25	12 B	<0.50	1.4 J	<8.0	<0.50	7.8	1.9 J, B	2.8	0.80 J	25	14	2.7 J
	Not Sampled	08/08/16								Well	is dry							
UFMW-03S	Not Sampled	08/15/17								Well	is dry							
	Not Sampled	10/06/17								Well	is dry							
	UFMW-03I-20160808	08/08/16																
UFMW-03I	UFMW-03I-20170817	08/17/17																
OFINIAA-091	UFMW-03I-20170817-FD	08/17/17																
	UFMW-03I-20171006	10/06/17	<5.0	<0.50	150	18	14 B	0.51 J	1.4 J	46	<0.50	33	7.6 B	2.3	<0.50	30	23	2.5 J
	UFMW-03D-20160808	08/08/16																
UFMW-03D	UFMW-3D-20170817	08/17/17																
	UFMW-03D-20171006	10/06/17	5.0 J, B	<0.50	120	18	8.7 B	<0.50	1.5 J	<8.0	<0.50	7.6	1.5 J, B	2.7	1.3	28	17	15 J

Notes:

USEPA United States Environmental Protection Agency

 μ g/L Microgram per liter mg/L Milligram per liter

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

F1 MS and/or MSD Recovery is outside acceptance limits.

B Compound was found in the blank and sample

-- Not Analyzed



Table G-4 - Summary of Groundwater Analytical Results-Chemical Field Study

AP Area

Well ID	Sample ID	Sample Date							Diss	olved Metals by (μց		1 6020						
			Aluminum	Antimony	Arsenic	Barium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Selenium	Thallium	Uranium	Vanadium	Zinc
	UFMW-04S-20160819	08/19/16																
UFMW-04S	UFMW-04S-20170816	08/16/17																
	UFMW-04S-20171005	10/05/17	7.1 J, B	1.0 J	180	23	2.1 B	<0.50	2.0	<8.0	<0.50	50	2.7 B	2.1	<0.50	24	40	3.7 J
	UFMW-04I-20160818	08/18/16																
115808/ 041	UFMW-04I-20160818-FD	08/18/16																
UFMW-04I	UFMW-04I-20170816	08/16/17																
	UFMW-04I-20171005	10/05/17	5.7 J, B	<0.50	180	15	7.0 B	<0.50	1.7 J	<8.0	<0.50	8.9	2.0 B	1.8 J	<0.50	18	36	6.0 J
	UFMW-04D-20160818	08/18/16																
UFMW-04D	UFMW-4D-20170816	08/16/17																
UFINIVV-04D	UFMW-04D-20171005	10/05/17	<5.0	<0.50	96	20	25 B	<0.50	1.7 J	<8.0	<0.50	3.8	1.5 J B	2.8	<0.50	23	20	30
	UFMW-04D-20171005-FD	10/05/17	<5.0	<0.50	98	20	25 B	<0.50	1.5 J	<8.0	<0.50	3.6	1.3 J B	2.7	<0.50	23	20	3.5 J
	UFMW-05S-20160819	08/19/16																
UFMW-05S	UFMW-05S-20170816	08/16/17																
	UFMW-05S-20171005	10/05/17	5.6 J, B	<0.50	120	31	1.3 J B	1.1	4.1	15 J	<0.50	130	4.0 B	5.1	<0.50	53	27	7.6 J
	UFMW-05I-20160823	08/23/16																
UFMW-05I	UFMW-05-20170816	08/16/17																
	UFMW-05I-20171004	10/04/17	<25	<2.5	140	24	15	<2.5	<2.5	<40	<2.5	32	<2.5	2.9 J	<2.5	27	28	<13
	UFMW-05D-20160822	08/22/16																
UFMW-05D	UFMW-5D-20170815	08/15/17																
	UFMW-05D-20171004	10/04/17	<25	<2.5	110	26	18	<2.5	<2.5	<40	<2.5	63	<2.5	4.2 J	<2.5	22	18	<13
	UFMW-06S-20160819	08/19/16																
UFMW-06S	UFMW-06S-20170815	08/15/17																
	UFMW-06S-20171005	10/05/17	<5.0	<0.50	140	26	5.8 B	0.63 J	1.3 J	<8.0	<0.50	40	2.3 B	3.9	<0.50	32	35	<2.5
	UFMW-06I-20160822	08/22/16																
UFMW-06I	UFMW-06I-20170815	08/15/17																
OLINIAA-001	UFMW-06I-20170815-DUP	08/15/17																
	UFMW-06I-20171004	10/04/17	<25	<2.5	160	29	9.3 J	<2.5	<2.5	<40	<2.5	10	<2.5	3.5 J	<2.5	28	32	<13
	UFMW-06D-20160822	08/22/16																
UFMW-06D	UFMW-06D-20170815	08/15/17																
	UFMW-06D-20171004	10/04/17	<25	<2.5	140	25	28	<2.5	<2.5	<40	<2.5	5.0	<2.5	4.4 J	<2.5	21	19	<13

Notes:

USEPA United States Environmental Protection Agency

 μ g/L Microgram per liter mg/L Milligram per liter

J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

F1 MS and/or MSD Recovery is outside acceptance limits.

B Compound was found in the blank and sample

-- Not Analyzed



					711 711 0							
				Gene	ral Water Quality Par	ameters using	Field Water Qualit	y Meter			Dye Testing	
Well ID	Sample ID	Sample Date	рН	Temp (°C)	Specific Conductivity (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Sulfide (mg/L)	Rhodamine	Uranine	Notes
	UFMW-01S-20160809	08/09/16	7.90	27.36	7.87	200	1.91	>1,000				
UFMW-01S	UFMW-01S-20170817	08/17/17	6.97	29.10	4.38	142	1.21	52.0		1.942	6.746	No visible dye
	Not Sampled	10/06/17					Wel	is dry		•		•
	UFMW-01I-20160809	08/09/16	7.62	29.84	6.53	164	0.56	1.9				
UFMW-01I	UFMW-01I-20170816	08/16/17	7.23	23.31	3.55	41	0.00	1.90		2.232	4.998	No visible dye
	UFMW-01I-20171006	10/06/17	7.40	22.95	2.98	110	0.24	0.0				No visible dye
	UFMW-01D-20160809	08/09/16	7.97	29.21	6.73	180	3.54	33.0				
UFMW-01D	UFMW-01D-20170816	08/16/17	7.23	25.24	5.20	61	0.69	0.10		1.294	4.090	No visible dye
	UFMW-01D-20171005	10/05/17	7.44	25.31	4.58	154	0.18	0.0				-
	UFMW-02S-20160810	08/10/16	7.15	27.03	10.3	219	1.89	>1,000			-	-
UFMW-02S	Not Sampled	08/17/17				Less Than	1" of Water Obser	ved in Well; Unable	to Sample.	•		
	Not Sampled	10/06/17					Wel	is dry				
	UFMW-02I-20160810	08/10/16	7.60	30.60	7.45	180	0.65	1.1				
UFMW-02I	UFMW-02I-20170817	08/17/17	7.30	24.52	4.74	90	0.00	0.7		1.112	7.779	No visible dye
	UFMW-02I-20171006	10/06/17	7.52	23.86	4.08	156	0.19	0.0				-
	UFMW-02D-20160810	08/10/16	7.79	29.39	8.02	171	0.58	5.5			-	-
UFMW-02D	UFMW-02D-20170817	08/17/17	7.30	25.81	5.59	66	0.00	0.0		1.004	5.422	No visible dye
	UFMW-02D-20171006	10/06/17	7.50	24.56	5.18	162	0.23	0.0				No visible dye
	Not Sampled	08/08/16					Wel	is dry				
UFMW-03S	Not Sampled	08/17/17					Wel	is dry				
	Not Sampled	10/06/17					Wel	is dry				
	UFMW-03I-20160808	08/08/16	7.64	33.48	6.85	152	1.50	0.0				
UFMW-03I	UFMW-03I-20170817	08/17/17	7.32	21.37	4.02	38	0.00	1.30		0.983	7.72	No visible dye
	UFMW-03I-20171006	10/06/17	7.21	20.92	3.90	100	3.06	0.0			-	No visible dye
	UFMW-03D-20160808	08/08/16	7.75	30.65	7.36	169	2.52	2.03				
UFMW-03D	UFMW-3D-20170817	08/17/17	7.30	23.26	4.95	84	0.00	0.30		2.135	8.418	No visible dye
	UFMW-03D-20171006	10/06/17	7.41	20.39	4.37	88	5.31	37.7				

Notes:

°C Degrees Celsius
mg/L Milligram per liter
mS/cm Millisiemens per centimeter

mV Milivolt

NTU Nephelometric turbidity units

-- Not Analyzed



					Ar Ait							
				Gene	ral Water Quality Par	ameters using	Field Water Quali	y Meter			Dye Testing	
Well ID	Sample ID	Sample Date	рН	Temp (°C)	Specific Conductivity (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Sulfide (mg/L)	Rhodamine	Uranine	Notes
	UFMW-04S-20160819	08/19/16	7.91	25.95	4.80	133	0.96	196				
UFMW-04S	UFMW-04S-20170816	08/16/17	7.20	27.00	4.60	150	0.18	0.00		1.113	6.675	No visible dye
	UFMW-04S-20171005	10/05/17	7.30	26.52	4.25	161	0.19	0.00				No visible dye
	UFMW-04I-20160818	08/18/16	7.84	29.16	4.28	125	2.12	12.0				
UFMW-04I	UFMW-04I-20170816	08/16/17	7.32	26.65	4.67	68	0.00	2.5		1.003	8.941	No visible dye
	UFMW-04I-20171005	10/05/17	7.31	26.37	4.02	153	0.10	0.0				No visible dye
	UFMW-04D-20160818	08/18/16	7.79	28.01	5.04	130	0.95	0.1				
UFMW-04D	UFMW-4D-20170816	08/16/17	7.42	26.69	5.12	75	0.00	1.80		1.342	5.770	No visible dye
	UFMW-04D-20171005	10/05/17	7.41	24.43	4.92	173	0.17	0.0				No visible dye
	UFMW-05S-20160819	08/19/16	8.14	26.66	5.65	31	1.13	205				
UFMW-05S	UFMW-05S-20170816	08/16/17	7.21	27.13	6.72	145	0.30	6.4		0.980	2.347	No visible dye
	UFMW-05S-20171005	10/05/17	5.58	25.08	9.02	206	1.63	68.4				No visible dye
	UFMW-05I-20160823	08/23/16	7.81	26.57	5.37	119	0.32	7.8				
UFMW-05I	UFMW-05-20170816	08/16/17	7.18	26.77	5.08	12	0.00	2.90		0.616	4.420	No visible dye
	UFMW-05I-20171004	10/04/17	7.13	27.50	5.39	109	0.51	3.80				No visible dye
	UFMW-05D-20160822	08/22/16	7.74	30.98	6.10	93	0.55	34.8				
UFMW-05D	UFMW-5D-20170815	08/15/17	7.20	27.49	6.47	116	0.00	0.50		0.745	2.316	No visible dye
	UFMW-05D-20171004	10/04/17	7.14	27.38	5.90	115	0.30	4.3				No visible dye
	UFMW-06S-20160819	08/19/16	7.57	29.61	5.32	88	0.85	5.4				
UFMW-06S	UFMW-06S-20170815	08/15/17	7.07	29.11	5.46	182	0.00	23.1		1.139	0.879	No visible dye
	UFMW-06S-20171005	10/05/17	5.93	23.97	6.34	164	1.99	0.3				No visible dye
	UFMW-06I-20160822	08/22/16	7.52	26.84	5.43	121	0.67	2.3				
UFMW-06I	UFMW-06I-20170815	08/15/17	7.18	26.65	5.71	185	0.51	0.00		2.175	4.069	No visible dye
	UFMW-06I-20171004	10/04/17	7.24	25.59	6.8	71	0.61	0.0			-	No visible dye
	UFMW-06D-20160822	08/22/16	7.78	29.67	6.61	134	2.46	5.2				
UFMW-06D	UFMW-06D-20170815	08/15/17	7.27	26.61	6.52	178	0.71	1.1		1.031	0.923	No visible dye
	UFMW-06D-20171004	10/04/17	7.51	26.76	5.97	49	0.62	9.0				No visible dye

Notes:

°C Degrees Celsius
mg/L Milligram per liter
mS/cm Millisiemens per centimeter

mV Milivolt

......

NTU Nephelometric turbidity units

