Entries for August 16-31, 2025

Market/Commercialization Information

FRANKLIN SLAG PILE SUPERFUND REMEDIATION PROJECT (PRESOL)

U.S. Army Corps of Engineers, Engineer Division North Atlantic, Philadelphia District, Philadelphia, PA
Contract Opportunities on SAM.gov W912BU26BA002, 2025

When this solicitation is released on or about October 8, 2025, it will be competed as a total small business set-aside under NAICS code 237990. The U.S. Army Corps of Engineers, Philadelphia District, on behalf of EPA, requires remediation of the former Franklin Slag site, located at the northeast corner of Castor and Delaware Avenues in Philadelphia, Pennsylvania. The site, in an industrial area, contains ~70,000 cubic yards of recycling slag impacted with hazardous lead and detectable RCRA 8 metals, secured by a chain link fence and capped with an HDPE liner. Castor Avenue and the shoulder of Delaware Avenue are available for contractor use, and about 25 feet of adjacent Philadelphia Water Department property can be used for relocating the untreated stockpile or storing treated material pending laboratory results. The Period of Performance is 2,008 calendar days, with major work including, but not limited to, preparation of preconstruction workplans, development and implementation of a Maintenance of Traffic Plan, mobilization and execution of a Security Plan, and implementation of Environmental Protection and Perimeter Air Monitoring Plans. The estimated price range is between $25,000,000 and $100,000,000. There is no solicitation at this time.
https://sam.gov/workspace/contract/opp/5d5fd144e2e2439b8fd7547481f64ee1/view

ARCHITECT-ENGINEER SERVICES FOR COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN VII) FOR NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND PACIFIC (PRESOL)

Department of the Navy, Naval Facilities Engineering Systems Pacific Command, Joint Base Pearl Harbor-Hickam, HI
Contract Opportunities on SAM.gov N62742-25-R-1800, 2025

This is an invitation for qualified firms interested in this future procurement to submit Standard Form 330. This future procurement will establish a Comprehensive Long-Term Environmental Action, Navy (CLEAN) contract to provide environmental technical and engineering services for NAVFAC Pacific, with a primary focus on the cleanup and restoration of contaminated sites under CERCLA under NAICS code 541330. Key activities include evaluating site conditions, conducting field investigations, sampling and analyzing environmental media, validating data, and performing risk assessments. The contractor will also support remedial planning and design, oversee cleanup construction, and prepare reports such as Preliminary Assessment/Site Inspection (PA/SI), Remedial Investigation/Feasibility Study (RI/FS), Remedial Design (RD), and Remedial Action Completion Report (RACR). Additional work may involve addressing emerging contaminants, investigating munitions and explosives of concern (MEC), and assessing sites with radioactive materials, as well as supporting compliance with Federal and DoD environmental and safety regulations. Work will occur on military property within the NAVFAC Pacific area of responsibility, often in locations with complex site conditions such as terrestrial, subsurface, marine, and coastal environments, and may involve multiple media of concern, including soil, groundwater, sediment, surface water, and air. Access to these sites is restricted to U.S. citizens or qualified personnel. Standard Form 330s are due by 8:00 PM EDT on October 30, 2025. https://sam.gov/workspace/contract/opp/8be1d5bef02f42ffb82b7f032d54002b/view

FPRESOLICITATION DISTRICT 17 ENVIRONMENTAL REMEDIATION SERVICES MULTIPLE AWARD CONTRACT (PRESOL)

U.S. Department of Homeland Security, U.S. Coast Guard, Civil Engineering Unit, Juneau, AK
Contract Opportunities on SAM.gov 70Z08725RJUNE28424423, 2025

When this solicitation is released, it will be competed as a total small business set-aside under NAICS code 562910. The U.S. Coast Guard's Civil Engineering Unit in Juneau, Alaska, seeks a contractor to support USCG shore infrastructure, real property, and other projects that cover a wide range of activities, including but not limited to restoration, remediation, compliance, planning, remote field work, investigations, surveys, hazardous materials management, hazardous waste management, pollution prevention, operational activities (e.g., training, permitting, and response actions) and real property agreements/transfers. Services will be required at a variety of facilities, buildings, and structures both onshore and offshore (e.g., bases, small boat stations, light stations, aids-to-navigation facilities, communications facilities). Services are often performed in remote, isolated areas of Alaska. Individual Task Orders will be issued to enhance and ensure compliance with applicable federal, state, tribal, and local environmental laws and regulations, executive orders, USCG policy, and other environmental stewardship directives. There is no solicitation at this time. https://sam.gov/workspace/contract/opp/0a4dd159734e4c5998a43a628de2acdd/view

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Cleanup News

EVALUATION OF WATERSHED-SCALE ACID MINE DRAINAGE TREATMENT IN THE MUDDY CREEK WATERSHED, WEST VIRGINIA

Spirnak, R., M. Shafer, C. Risch, M. O'Neal, and P. Ziemkiewicz.
Mine Water and the Environment (2025)

Acid mine drainage (AMD) from historic, unregulated mining in the eastern U.S. Appalachian Coal Basin has impaired thousands of stream kilometers. A project evaluated watershed-scale restoration (WSR) to restore designated uses to a given watershed by treating AMD from both abandoned mine lands and regulated discharges based on their load contribution and the cost per recovered stream length. Results were compared to pre-project impairment levels and costs. Despite higher capital costs for WSR, lower operating costs resulted in net savings over the point source treatment strategy. Treatment of only regulated discharges was more expensive over the long term and resulted in the recovery of zero stream kilometers. Managing AMD treatment at a watershed scale rather than at regulated discharges only may produce superior economics in similar watersheds. Restoration is achieved more quickly, with more stream kilometers recovered. *This article is* ***Open Access*** *at* https://link.springer.com/article/10.1007/s10230-025-01052-1.

RESTORING PERFORMANCE OF RO MEMBRANES WITH SEVERE SCALING FROM CONTAMINATED TAILINGS POND WATER SOURCE USING SPECIALTY CLEANERS

Sankhe, A.Y., S. Alves, and G. Sato. Proceedings of Mine Water Solutions Conference, 16-18 June, Vancouver, Canada, 2025

Tailings water contaminated with mining waste undergoes reverse osmosis (RO) treatment to be discharged to the environment. The system has experienced several performance issues, mainly from fouling and scaling, resulting in reduced normalized permeate flow and cleanings every 1 to 2 weeks using generic cleaners. A third-party membrane autopsy was performed to select an appropriate specialty cleaner based on the composition of the foulants, their location, and the design of the plant. The performance recovery after cleaning with specialty high, low, and silica-specific cleaners is discussed and compared to historical data from the system when cleaned with generic cleaners. For remote locations, such as this site, the selection of specialty cleaners is often influenced by several factors. While ergonomics, ease of use, extreme storage conditions, and transportation are seldom used as criteria for chemical selection, they were considered in this specific case during the chemical selection process. *See pages 193-204:*
https://www.mineconferences.com/bluepixeldesign/wp-content/uploads/2025/06/FINAL-Proceedings-of-Mine-Water-Solutions-2025-3.pdf

EMERGENCY RESPONSE WATER TREATMENT AT THE EAGLE MINE: CHALLENGES AND LESSONS LEARNED

Jacobson, A., B. Baker, C. Anderson, K. Ljubetic, H.C. Liang, and D. Kratochvil. Proceedings of Mine Water Solutions Conference, 16-18 June, Vancouver, Canada, 2025

Failure of the gold heap leach facility at the Eagle Mine led to the release of ~4 million tonnes of ore saturated with cyanide leach solution, of which 2 million tonnes escaped containment. The ore migrated to downgradient areas coming into contact with surface water. The site's existing water treatment infrastructure was inadequate to treat the cyanide-laden water. Given the high risk of exceeding the site's available water storage capacity, the lack of preparedness for cyanide treatment, and the stringent effluent limits to protect the surrounding pristine environment, the situation constituted a serious environmental emergency. This paper outlines the emergency response strategy initiated in September 2024, which focused on the rapid adaptation and expansion of the existing water treatment plant to mitigate the immediate environmental risks posed by the cyanide-contaminated water. *See pages 277-288:*
https://www.mineconferences.com/bluepixeldesign/wp-content/uploads/2025/06/FINAL-Proceedings-of-Mine-Water-Solutions-2025-3.pdf

WRESTLING THE BEAST: MINE WATER MANAGEMENT AT THE LEGACY FARO MINE SITE, YUKON TERRITORY, CANADA

Karcher, G. Proceedings of Mine Water Solutions Conference, 16-18 June, Vancouver, Canada, 2025

The Faro Mine Complex is an abandoned open-pit lead-zinc mine that was abandoned in 1998, after operating for almost 30 years, and has been in care and maintenance since. Metal leaching and acid-rock drainage are major problems at Faro due to the large volumes of sulfidic waste rock and tailings near water courses. The mine site lies in the traditional territory of the Kaska First Nation and is upstream of the Selkirk First Nation, who rely on salmon as a food source. Managing contact and non-contact water presents a full-time challenge at the site. Extensive effort and resources are expended to keep clean water clean and to minimize and treat contact water. Seasonally, 21 million m^3 of clean water is diverted around the site through six diversions around the main open pit, waste rock dumps, and tailings containment area; 7.5 million m^3 of contaminated water are treated and discharged by two water treatment plants. Annually, 1,700 water samples are taken to ensure compliance with the water treatment plant discharge. Another major water management challenge is maintaining a freeboard in the main pit where the contaminated water is stored to await seasonal treatment. Numerous groundwater seepage collection points exist, including the main seepage interception system downstream of the tailings containment area. The paper details the water management configuration at the Faro Mine, including surface water management to keep clean water clean; water treatment collection, treatment, and discharge process; and the groundwater collection and conveyance. Significant challenges and solutions are discussed, including construction, water balance, collection efficiencies, logistics of working in the cold and remote areas of the Yukon, and integration with the closure plan. *See pages 205-217:*
https://www.mineconferences.com/bluepixeldesign/wp-content/uploads/2025/06/FINAL-Proceedings-of-Mine-Water-Solutions-2025-3.pdf

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Demonstrations / Feasibility Studies

BIOSALIX: MINE RECLAMATION USING FABRICATED SOILS AND ORGANIC RESIDUALS TO AUGMENT SOIL QUALITY

SYLVIS Environmental, 55 pp, 2024

The BIOSALIX project offers an innovative solution to address key challenges of large-scale mine reclamation, biosolids management, climate change mitigation, and energy transition by establishing a short-rotation coppice willow plantation. BIOSALIX uses biosolids to improve willow establishment by amending marginally productive soils characteristic of reclaimed mines and to augment existing soil resources. To achieve this goal, ~12,000 dry tonnes of biosolids were transported from the Gold Bar Wastewater Treatment Plant to Westmoreland's Paintearth Mine. Biosolids were applied to a spectrum of reclamation areas to facilitate willow growth and rectify reclamation trajectories via amendment addition to improve soil tilth, fertility, and organic matter status. Willows were planted into biosolid-amended soils at rates up to 20,000 stems/hectare using specialized planting equipment combined with conventional agricultural practices. Challenges during project execution included a global pandemic, extreme climatic conditions, and unanticipated early coal production cessation at the project site, reinforcing the timely nature of the BIOSALIX concept and successes that have been achieved. Stands of willows exceeding 2 m in height are now growing in marginal, disturbed prairie soils, and > 500 hectares of mined land at Paintearth have been amended with biosolids. Direct benefits extend beyond the beneficial use of biosolids, reclamation of mine land, and diversification of the regional economy. The system is contributing to climate change mitigation efforts as it meets carbon sequestration targets related to biosolids application and continues to strive towards those targets for willow development. The system has also helped re-establish local biodiversity, providing fodder and habitat for wild animals such as pronghorns and rabbits. The system fostered within the project presents a unique means of confronting evolving economic realities, especially in conjunction with the lessons learned and knowledge gained from the initial operationalization of the concept. https://www.eralberta.ca/wp-content/uploads/2024/12/BIOSALIX-ERA-Final-Report-FINAL-March-2024.pdf

IMMEDIATE BENEFITS OF REMEDIATION WETLANDS DESIGNED FOR TREATING ACID MINE DRAINAGE ON SIGNAL MOUNTAIN, TENNESSEE

Tharp, M.S. Master's thesis, The University of Tennessee at Chattanooga, 131 pp, 2025

A study documented the changes in water quality before, during, and after wetland construction at two sites that flow into Freudenberg Creek. Samples were collected over a year, allowing for seasonal factors to be observed. The construction of wetlands at these contaminated sites demonstrated an immediate decrease in acidity, alkalinity, and conductivity values. Concentrations of expected ions like iron and sulfate decreased at one site; however, ion concentrations were unchanged at the second location. The study focused on the immediate response to wetland construction; however, it is likely that with time, efficiency will increase for both areas. Ultimately, long-term benefits will be dependent on wetland upkeep through human intervention.
https://scholar.utc.edu/cgi/viewcontent.cgi?article=2158&context=theses

USE OF MERCLOKTM P-640 TO REDUCE ELEMENTAL MERCURY BEADS AND REMEDIATE HIGHLY CONTAMINATED MINING WASTES

Fontenot, C. | American Society of Reclamation Sciences 41st Annual Meeting, 2-5 June, Knoxville, TN, 20 slides, 2024

MercLok™ P-640 is an in situ mercury treatment technology developed to address environmental impacts from mercury contamination from mining, chlor-alkali, munitions, and other manufacturing sites. It is designed to capture and sequester multiple species of mercury, including elemental mercury, reducing diffusion into groundwater and surface water. A pilot study was conducted at an abandoned mercury mine site in California. Layers of unamended (controls) and MercLok-amended calcines were arranged in open-top container "reactors" representing two alternative application techniques and various dosages. Rainwater was allowed to enter the reactors to simulate natural leaching of mercury. The leachate was sampled monthly and analyzed for total mercury, dissolved mercury, and methylmercury. Calcine solids were analyzed at the beginning and end of the exposure/leaching period for total and leachable mercury. Results demonstrate MercLok reduced total mercury leaching by up to 99%, methylmercury in leachate by 75%, and the leachability of mercury from the calcine materials to below hazardous solid waste classification limits. MercLok, water, and elemental mercury beads were placed into sealed bottle reactors and agitated over several days to evaluate the capture and sequestration of elemental mercury. Each day, the samples were visually inspected for the presence of mercury beads. At the end of the study, no beads were visible within the samples. Analysis by USEPA method 7473 indicated that the solid MercLok portion of the sample contained the majority of the mass of mercury added to each reactor, though elemental mercury was not visible within the amendment matrix. Additionally, Toxicity Characteristic Leaching Procedure (TCLP) analysis of the filter cakes from each reactor was only able to extract a maximum of 0.002% of the total mercury mass at the lowest dosage of MercLok, which was below TCLP criteria.
https://www.asrs.us/wp-content/uploads/2024/08/Fontenot_301C.pdf

STABILIZATION OF AS AND SB IN CONTAMINATED ACIDIC SHOOTING RANGE SOIL WITH APATITE MINE TAILINGS: CHALLENGE OF CO-CONTAMINATION

Venalainen, S.H., A, Nousiainen, M. Silvennoinen, and S. Kanerva.
Soil & Environmental Health 3(1):100124(2025)

A study investigated the potential of phosphate mine tailings used to immobilize Pb to stabilize acidic shooting range soil without incurring the risk of enhanced Sb and As solubility. In a 2.5-year field trial, soil of a former shooting range, surface-treated with tailings consisting of phlogopite, carbonate minerals calcite and dolomite, and residues of apatite, showed no evidence of increased Sb or As solubility. Results from a parallel lab-scale pot experiment carried out with test soils from the field site supported the findings. Under acidic conditions, dissolution of the carbonate fraction of the tailings and the subsequent decrease in soil acidity contributed to the release of Sb and As from organic associations and/or Al/Fe (hydr)oxide surfaces. The abundant Ca^{2+} ions liberated upon carbonate dissolution probably reacted with the anionic species of Sb and As to form sparingly soluble Ca-antimonates and Ca-arsenates. Moreover, the solubility of intrinsic and apatite-derived P in the test soils, initially hypothesized to compete for adsorption with Sb and As and thereby increase their solubility, also decreased after tailings treatment. In conclusion, Pb-contaminated shooting range soil was successfully stabilized with the tailings without increasing Sb or As solubility.

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Research

EVALUATION OF GLYCOLIPID FUNCTIONALIZED ORGANOSILICA MEDIA FOR ADSORPTION OF RARE EARTH ELEMENTS AND URANIUM.

Hogan, D.E., M. Dardona, K. Graves, C.M. Tummala, S. Praneeth, C. Boxley, R.M. Maier, and T.M Dittrich.
Journal of Environmental Management 391:126500(2025)

Six glycolipid-functionalized media were examined for the recovery of rare earth elements (REE) and uranium (U) as a function of pH. At pH 7, U adsorption exceeded REE in 5 of the 6 media, with nearly 100% of U absorbed by media containing either a single-chain galactolipid, two-chain rhamnolipid, or a two-chain xylolipid. REE sorption was the highest in the two-chain rhamnolipid medium, reaching 96%. The single-chain glucolipid medium sorbed little to no metal. Due to its good performance, the two-chain rhamnolipid medium was further evaluated at pH levels ranging from 7 to 2.75. Adsorption of both REE and U remained near 100% from pH 7 to 3.25. At pH 3, REE adsorption decreased to 20% but U remained near 90%. At pH 2.75, neither REE (0%) nor U (10%) were strongly bound. The media were washed three times, followed by total carbon analysis to examine glycolipid loss and glycolipid-media stability. Glycolipid loss ranged from

MULTI-CONTAMINANT REMOVAL FROM SYNTHETIC MINE-IMPACTED WATER BY PERMEABLE REACTIVE BARRIERS UNDER COLD CONDITIONS

Desmau, M., E.K. Skierszkan, G. Oka, I. Kaur, V.A. Schoepfer, D. Flather, and G. Nielsen.
Chemosphere 384:144499(2025)

A study applied bench-scale columns mimicking permeable reactive barriers (PRB) containing varying proportions of zero-valent iron (ZVI), gravel, and wood chips to treat synthetic mine-impacted water containing nitrate, arsenic, and uranium at low temperatures (5°C) over 36 weeks. Columns were amended with sodium acetate during weeks 20-33 to stimulate microbial activity. Speciation was investigated by combining X-ray absorption spectroscopy and geochemical speciation modeling using PHREEQC. During the experiment, arsenic removal efficiency exceeded 95% in all ZVI-bearing columns, mostly driven by adsorption and coprecipitation with ZVI oxidation products. Nitrate removal was limited in the absence of acetate amendments, but improved to ~50 % during amendment. Denitrification to N2 gas was incomplete, likely due to kinetic limitations on the various nitrogen reduction reaction steps. Uranium removal was >95 % in ZVI-bearing columns before the acetate amendment, predominantly explained by U(VI) adsorption onto Fe-(oxyhydr)oxides. However, U was remobilized during amendment, likely due to increased aqueous complexation of U by calcium and carbonate that drove the desorption of U from Fe-(oxyhydr)oxides. Results show that PRB technology holds promise for multi-contaminant removal under cold conditions, while exposing ongoing challenges associated with concurrent removal of contaminants exhibiting contrasting geochemical behavior.

A COMPARATIVE STUDY ON IN-SITU SYNTHESIS OF TWO IRON NANOPARTICLES IN ACID MINE DRAINAGE USING GREEN TEA AND EXCOECARIA COCHINCHINENSIS LEAVES EXTRACTS

Cao, Z., Z. Pan, and Z. Chen. | Chemosphere 381:144488(2025)

An eco-friendly method to synthesize iron nanoparticles (FeNPs) in situ in AMD using *Excoecaria cochinchinensis* leaves (EC) and green tea extracts (GT) as reducing/stabilizing agents is presented to enable simultaneous removal of heavy metals and metalloids. Two FeNPs (EC-FeNPs and GT-FeNPs) produced in AMD exhibited distinct structural and reactive properties. Removal efficiencies of EC-FeNPs for As, Ni, and Cd were 20.4%, 15.31%, and 11.62%, respectively, while those of GT-FeNPs were 10.07%, 11.7% and 19.76%, respectively. This indicates that EC-FeNPs were generally more effective than GT-FeNPs in removing heavy metals and metalloids from AMD. EC-FeNPs (170.14 ± 3.22 nm) displayed larger particle sizes and more stable surface charges compared to GT-FeNPs (127.14 ± 1.94 nm), which could be attributed to differences in functional groups in the respective plant extracts. Both EC and GT extracts acted as reductants and stabilizers in the synthesis of two FeNPs, with EC extracts providing a larger amount of phenolic compounds and carboxylic acids than GT extracts.

INNOVATIVE GREEN VERMI-REMEDIATION OF CHROMITE-ASBESTOS MINE WASTE: FROM TOXICITY REDUCTION TO SOIL-CROP-MICROBE HEALTH IMPROVEMENT UTILIZING NOVEL MULTIMODAL STATISTICAL APPROACH

Banerjee, S., S. Ghosh, S. Jha, and P. Bhattacharyya.
Journal of Environmental Chemical Engineering 13(2):116019(2025)

A study aimed to assess the potential of vermi-remediation technology for transforming hazardous chromite-asbestos mine waste (CAMW) into valuable agricultural resources. Key objectives were to 1) determine a suitable feedstock combination for effective vermi-remediation; 2) offer new insights regarding microbe-toxic element (TE) interactions during vermicomposting; and 3) validate the efficacy of *Eisenia fetida* by examining CAMW-induced alterations in microbial community structures, TE removal, and nutrient dynamics. Cow dung (CD) was combined with CAMW at ratios (1:1 and 1:2) for large-scale vermicomposting, with results compared to CD alone. Earthworm counts in CAMW-vermibeds increased by 4.89-5.92 times. Bioavailable TE levels (Ni, Cd, Cr, Pb, and Cu) were significantly reduced up to 80% in vermibeds. Also, CAMW-rich mixtures [T1: CD+CAMW (1:1)] saw significant acidity neutralization, improved organic carbon mineralization, and increased NPK levels. Vermicomposting showed greater microbial proliferation and enzyme activity in T1 species diversity. Phospholipid fatty acid (PLFA) analysis revealed that the structure of microbial communities and fatty acid profiles showed substantial variation with varying CAMW content in vermibeds. Further Sobol analysis demonstrated the susceptibility and resilience of microbial populations in response to certain TEs. CAMW-vermicompost application boosted sesame growth and improved soil health with negligible TEs transfer.
https://www.sciencedirect.com/science/article/pii/S2213343725007158/pdfft?md5=651530cc107953084848ad5672f980950d&pid=1-s2.0-S2213343725007158-main.pdf

HABITAT RECOVERY FROM DIVERTED ACID MINE DRAINAGE POLLUTION DETERMINED BY INCREASED BIODIVERSITY OF RIVER AND ESTUARINE BENTHIC SPECIES

Dean, A.P., J. Nelson, A.P. Jones, A. Sykes, F. Child, C.J. Sweeney, K. Al-Thaqafi, K.N. White, and J.K. Pittman. Science of The Total Environment 966:178726(2025)

A study examines the consequences of diverting acid mine drainage (AMD) away from a highly contaminated river and estuary using water quality and ecological data from pre- and post-diversion sample periods. Ten to 12 years following diversion, water quality and benthic macroinvertebrate biodiversity significantly improved at all sample sites of the river, indicative of ecological recovery. Upstream sites that were closer to the pollution source were less improved. Redirection of the AMD into a nearby stream channel caused an almost complete loss of benthic macroinvertebrates. Habitat recovery at the river estuary was demonstrated by increased richness of infaunal invertebrates and rocky shore species, including crustaceans, barnacles, and mollusc species. Measurements of copper bioaccumulation in the barnacle *Austrominius modestus* showed a significant reduction in current samples compared to those collected before AMD diversion. Results show that within a decade, an estuarine and river system can demonstrate ecological recovery from AMD pollution, yet within this time period, recovery did not fully match uncontaminated sites. https://www.sciencedirect.com/science/article/pii/S0048969725003602/pdfft?md5=7baf5ef8c9d6b35d073f30210ec06f00&pid=1-s2.0-S0048969725003602-main.pdf

INNOVATIVE DUAL-PURPOSE REMEDIATION OF ACID MINE DRAINAGE AND RESOURCE RECOVERY THROUGH MEMBRANE DISTILLATION CRYSTALLIZATION

Nthunya, L.N., A. Ali, H. Richards, L. Chimuka, C. Quist-Jensen, and B.B. Mamba.
npj Clean Water volume 8, Article number: 61 (2025)

A study evaluated an innovative application of membrane distillation crystallization (MDCr) for dual treatment and resource recovery from acid mine drainage (AMD). The AMD was characterized by high concentrations of Ca^{2+} (2,622 mg/L), Fe^{2+} (1,421 mg/L), SO_4^{2-} (9,790 mg/L), and Cl^- (1,113 mg/L). The current study evaluated the performance of hollow fiber polypropylene membrane in processing both acidic (pH 3.58) and neutralized (pH 6.47) feedwaters. The permeate was 3.3 kg/m^2/h, 2.2 kg/m^2/h, and 1.3 kg/m^2/h at 70, 60, and 50°C, respectively, which remained relatively stable at high recovery factors (>80%). Acidic AMD promoted the formation of large metal-rich ettringite and halite crystals, while neutralized AMD produced small and dense ettringite, hexahydrite, and jarosite crystals. *This article is* ***Open Access*** *at* https://www.nature.com/articles/s41545-025-00489-9

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General News

UPCYCLING MINE TAILINGS INTO FUNCTIONAL MATERIALS FOR ENVIRONMENTAL REMEDIATION AND ENERGY STORAGE APPLICATIONS

Niro, R., A. Peter, A.L. Teik, Z. Lee, F. Koo, T.J. Wong, and Y. Andou.
International Journal of Energy and Water Resources (2025)

This review investigates converting mine tailings (MT) into functional materials for wastewater treatment and energy applications, highlights recent advancements in recovering functional materials from MT, and identifies key challenges and opportunities for future research and development.

UNRAVELLING THE ADVANCES AND POTENTIAL OF FORWARD OSMOSIS IN ACID MINE DRAINAGE REMEDIATION: A COMPREHENSIVE REVIEW AND BIBLIOMETRIC ANALYSIS

Mogashane, T.M., J.P. Maree, A.C. Mkhohlakali, L. Mokoena, and J. Tshilongo.
Journal of Environmental Chemical Engineering 13(5):118162(2025)

The utilization of forward osmosis to treat acid mine water is critically examined in this review, with an emphasis on environmental impact, membrane technology, and process efficiency. Potential benefits of forward osmosis include decreased fouling and energy usage. Recent developments in forward osmosis membrane materials, such as the creation of innovative thin-film composites and nanocomposite membranes that improve performance and selectivity, are thoroughly examined in this study. The review also covers important elements affecting the efficiency of the forward osmosis process, including membrane fouling, energy recovery techniques, and draw solution selection. Despite these developments, there are still issues with membrane fouling, draw solution control, and the viability of expanding forward osmosis systems for broad use from an economic standpoint. A bibliometric analysis revealed that the field is still in its early stages but has shown a positive research trajectory from 2009 to 2024. This review highlights the special benefits and drawbacks of forward osmosis by contrasting it with conventional mine water treatment technologies, offering insights into its potential future use in the mining sector. The review includes suggestions for further investigation and advancement to remove current

obstacles and maximize the use of forward osmosis in the treatment of acid mine water.

FROM WASTE TO WEALTH: A CIRCULAR ECONOMY APPROACH TO THE SUSTAINABLE RECOVERY OF RARE EARTH ELEMENTS AND BATTERY METALS FROM MINE TAILINGS

Chowdhury, M.O.S.C. and D. Talan. Separations 12(2):52(2025)

This paper compiles a comprehensive review of critical minerals, lithium, cobalt, nickel, and rare earth elements, and provides insights regarding their recovery with a focus on the latest technological advancements. By exploring key innovations in separation processes, the review demonstrates how these technologies are addressing supply chain bottlenecks while simultaneously reducing the environmental footprint of mining operations. It advocates for a holistic approach to mine waste management, integrating mineral recovery with environmental remediation, and emphasizes the dual benefits of recovering valuable resources while purifying contaminated water and mitigating pollution risks. The proposed circular economy model suggests a sustainable blueprint for managing mine tailings, emphasizing resource reuse, waste reduction, and economic viability. https://www.mdpi.com/2297-8739/12/2/52

RECLAMATION SATISFACTION AND POST-MINING LAND USE POTENTIAL IN CENTRAL APPALACHIA, US

Poudyal, N.C., B.R. Gyawali, and S. Acharya.
The Extractive Industries and Society 20:101550(2025)

Using surface mining in Kentucky, this study assessed landowners' and their neighboring residents' perceptions of environmental change, satisfaction with reclamation, and perceived barriers and opportunities to use reclaimed land to benefit the landowners and the broader community. Poor satisfaction with reclamation efforts and only modest success in effectively managing reclaimed land for the intended use were largely due to inadequate reclamation. Financial incentives, legal assurance, and better reinforcement of reclamation rules were perceived as potentially useful policy interventions to help landowners use the reclaimed lands effectively. While acceptable to residents, landowners were unlikely to adopt educational projects, public parks, and biofuel crops. However, they were relatively more likely to adopt farmland, timber, and nature conservation uses that were also highly acceptable to the neighboring residents. While this study focused on mining, findings shed light on the social dynamics of mining's effects, reclamation, and the feasibility of land use alternatives in regions influenced by extractive industries.

OPEN-PIT MINE RECLAMATION MONITORING AND MANAGEMENT FOR A SUSTAINABLE FUTURE USING DRONE TECHNOLOGY: A REVIEW

Chand, K., M.F. Bhat, R. Koner, Y. Fissha, N. Rao Cheepurupalli, T. Saidani, and H. Ikeda.
Drones 9(9):601(2025)

This paper provides a comprehensive review of drone technology utilization in open-pit mine reclamation monitoring. Mining 4.0 has shown promise in open-pit mine monitoring for drone deployment for use in green mining practices. The review synthesizes current research on drone survey platforms, various sensor technologies, and their practical field applications within open-pit mines for mine reclamation monitoring; aims to establish a robust framework for the monitoring and management of mine reclamation; and provides a technically reliable reference, advancing the knowledge and application of drone technology for reclamation monitoring and management. *This article is* ***Open Access*** *at* https://www.mdpi.com/2504-446X/9/9/601.

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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