Technology Innovation News Survey

Entries for November 16-30, 2021

Market/Commercialization Information

USACE TULSA DISTRICT RFP FOR $45M ERS SB SET-ASIDE MEGA IDC MATOC
U.S. Army Corps of Engineers, Tulsa District, Tulsa, OK
Contract Opportunities on SAM.gov, Solicitation W912BV21R0019, 2021

When the RFP is released on or about March 18, 2021, it will be competed as a total small business set-aside. The USACE Tulsa District anticipates awarding up to five indefinite-delivery contracts (IDCs) with a maximum shared capacity of $45M under a firm-fixed-price MATOC (multiple-award task-order contract) for environmental remediation services (ERS) projects assigned to the Regional Planning and Environmental Center (RPEC) and the Southwestern Division. Contracts will have a base period of three years and one two-year option. The IDCs awarded will be firm fixed price for control and remediation of environmental contamination from pollutants, toxic substances, radioactive materials, hazardous materials, munitions and explosives of concern, and munitions constituents. Monitor beta.SAM for updates to this notice. Proposals are anticipated to be due by 3:00 PM CT on January 11, 2022.
https://sam.gov/opp/13619f7e1e034568adf2838e8b8ec3a3/view

CASCADE AND BATTELLE COLLABORATE TO APPLY PATENTED ENVIRONMENTAL REMEDIATION TECHNOLOGY FOR RECALCITRANT CONTAMINANTS
Business Wire, 18 Feb 2021

Battelle (Columbus, OH) has developed a patented formulation of a proprietary mixture of fungal-derived, oxidoreducing, time-release encapsulated enzymes for rapid degradation of recalcitrant contaminants, such as petroleum hydrocarbons, PCBs, and PAHs. Battelle is planning a collaborative effort with Cascade Environmental (Bothell, WA) to explore the use of the of encapsulated enzyme beads at cleanup sites via techniques such as soil blending and in situ injection. https://www.businesswire.com/news/home/20210218005758/en/Cascade-and-Battelle-Collaborate-to-Apply-Patented-Environmental-Remediation-Technology-for-Recalcitrant-Contaminants

INDEFINITE DELIVERY ARCHITECT-ENGINEER CONTRACT FOR HAZARDOUS, TOXIC AND RADIOACTIVE (HTRW) SERVICES, PRIMARILY VARIOUS LOCATIONS, ALASKA
U.S. Army Corps of Engineers, Alaska District, Anchorage, AK.
Contract Opportunities on SAM.gov, Solicitation W911KB22R0007, 2021

The U.S. Army Corps of Engineers is conducting market research to facilitate a determination of acquisition strategy for environmental services to include investigation, planning, and design for cleanup of HTRW, debris, and other environmental contaminants at various locations in Alaska. This Sources Sought is open to all qualified prime contractor firms (large and small businesses under NAICS 541330, SB size standard $15M). Responses to this announcement are due no later than 10:00 AM Alaska Time on January 18, 2022. https://sam.gov/opp/24019b24b1af4cf07ba983ed5279babac/view

DEPARTMENT OF ENERGY OFFICE OF ENVIRONMENTAL MANAGEMENT SPECIAL NOTICE: PROCUREMENT SCHEDULE UPDATE
Department of Energy, Office of Environmental Management (DOE-EM).
Contract Opportunities at SAM.gov, EM_PROCUREMENT_UPDATE, 2021

DOE-EM expects to proceed with reasonable acquisition schedules and revised process considerations as necessary due to enhanced telework, social distancing, and travel restrictions. To mitigate resource surges, Final RFP releases will be staggered accordingly and any proposal preparation time periods may be extended. Following are updated current projections for all major DOE-EM Final RFP releases for planning purposes for the next six months. Final RFPs for major acquisitions for the 6-month period through May 2022 will be released no sooner than the following time frames:

- EM Elemental Mercury Long-Term Management and Storage - January 2022
- Technical Assistance Contracts for EM Field Sites - February 2022 (Note: Synopsis to be released prior to posting of the Final RFP)
- Depleted Uranium Hexafluoride Operations and Site Mission Support - March 2022
- Portsmouth Decontamination and Decommissioning - March 2022

https://sam.gov/opp/08fde82c23e943ea8343a45c98df6f0e/view

Cleanup News

IN SITU ELECTROKINETIC (EK) REMEDIATION OF THE TOTAL AND PLANT AVAILABLE CADMIUM (CD) IN PADDY AGRICULTURAL SOIL USING LOW VOLTAGE GRADIENTS AT PILOT AND FULL SCALES
Cao, Z., Y. Sun, Y. Deng, X. Zheng, S. Sun, M. Romantschuk, and A. Sinkkonen.
Science of The Total Environment 785:147277(2021)

A 14-day electrokinetic (EK) remediation was carried out in a field pilot (4 m^2) test and a full-scale (200 m^2) application at a Cd-contaminated paddy agricultural field near a mining area. A low voltage of 20 V was applied at both scales; the voltage gradients were 20 V/m (pilot) and 4 V/m (full scale). Samples were taken from near the anode and cathode, and in the middle of the electric field, in 0-10 cm, 10-20 cm, and 40-50 cm soil layers. After EK remediation, a significant portion of the total Cd was removed in all the layers at the pilot-scale, by 87%, 72%, and 54% from the top down; 74% was removed in the 0-10 cm layer at full scale. Significant removal (64%) of plant-available Cd was observed in the 0-10 cm layer at the pilot scale. The percentage reduction of the electrical conductivity and removal efficiency of the total Cd was higher near the anode than the cathode. The soil pH was elevated near the cathode but stayed below pH 6 due to the sufficient supply of lactic acid. After remediation, the concentration of the total Cd dropped below the 0.4 mg/kg dry wt soil hazard threshold for agricultural paddy fields in China. A total energy of 2 kW·h and 0.6 kW·h was consumed at the pilot and full scales, respectively.

PEROXIDE TREATMENT AT THE GLADDEN DISCHARGE TO MILLER RUN
Sweeney, C. l 2021 PA Abandoned Mine Reclamation Conference, 27-28 October, Virtual, 26 minutes, 2021

The newly constructed Gladden acid mine drainage treatment plant restored four miles of Millers Run and 4.2 miles of Chartiers Creek to the confluence with Robinson Run. The facility employs active treatment technology and utilizes 50% hydrogen peroxide to achieve treatment of the iron-laden net alkaline mine water. This facility is the first plant in Pennsylvania designed from inception to utilize this technology. https://www.youtube.com/watch?v=DJZ5-FIpoQQ

BEAR RUN WATERSHED RESTORATION
Clark, T. l 2021 PA Abandoned Mine Reclamation Conference, 27-28 October, Virtual, 46 minutes, 2021

The first project funded by the Watershed Renaissance Initiative under the Pennsylvania Department of Environmental Protection Growing Greener Program was the restoration of Bear Run. Nine projects combining passive and semi-active technologies, mine refuse removal, and abandoned mine land reclamation projects for deep mine drainage treatment have been completed over the past 8 years. Through these restoration efforts, much of the South Branch of Bear Run and the mainstem of Bear Run have improved to hold populations of wild brook trout once again. Continued work in the watershed is focused on diffuse surface mine seepage areas using alkaline addition, revegetation, and reforestation projects. The tour highlights some of the larger projects and discusses past, current, and future work to continue improving the headwater West Branch Susquehanna River tributary.

TWOMILE RUN AMD RESTORATION SWAMP AREA PASSIVE TREATMENT SYSTEM VIRTUAL TOUR
Wolfe, N. l 2021 PA Abandoned Mine Reclamation Conference, 27-28 October, Virtual, 37 minutes, 2021

Restoration efforts of the Twomile Run watershed in western Clinton County, once impaired by abandoned coal mines, resulted in the recovery and reconnection of 6 miles of native brook trout stream. The largest and most significant of the nine treatment systems constructed is the Swamp passive treatment system due to its severe water quality and upstream position in the watershed. Constructed in 2012 and funded by grants, the swamp system consists of three vertical flow ponds, two settling ponds, and two aerobic wetlands. Raw water entering the system averages 92 gal/min with pH 2.99, acidity 437 mg/L, Fe 54 mg/L, and Al 22 mg/L. The average effluent pH is 7.6 with 169 mg/L alkalinity, and both Fe and Al concentrations are < 1 mg/L. Though the water quality is considered high-risk, the system has performed reliably with minimal maintenance. https://www.youtube.com/watch?v=M0ZiQbKI7-U&feature=youtu.be

THE GLADSTONE TREATMENT PLANT: CHALLENGES AND LESSONS LEARNED FROM FIVE-YEARS OF OPERATION TREATING MIW FROM THE GOLD KING MINE
Guy, K. l Colorado Environmental Management Society Mining Mini-Conference, 11 May, virtual, 2021

Mine-influenced water discharging from the Gold King Mine is treated at the Gladstone Water Treatment Plant near Silverton, Colorado through a lime neutralization, flocculation, and precipitation process. Maintaining successful operation at the site is challenging. Upgrades and modifications have been necessary while the plant runs 24-hours/day, 365 days/year. Physical challenges include the plant's remote location at 10,500 ft, extreme weather conditions (summer monsoons and winter avalanche conditions), and lack of suitable space for treatment plant facilities and sludge management. Plant flows vary between 300 and 600 gals/min. Seasonal changes in pH range between 1.8 and 5 and cause a significant increase (up to 10X) in metal loading during spring and summer months, requiring the plant to run near capacity at times. The flocculation process creates a high-moisture content waste sludge that requires multiple drying stages. Clarifier solids are gravity fed to 1,200 yd^3 geotextile bags for initial dewatering, then excavated, spread on a drying pad, and temporarily stored on-site. Balancing these challenges requires proactive risk management, attention to logistical constraints, and working with the small mountain community. *See times 1:57-2:39:*
https://www.gotostage.com/channel/32cea236cdfe49b2ade7fe267e5dfdfd/recording/51645480f6ba4da082d2a2e87da4ed57/watch

Demonstrations / Feasibility Studies

FINAL TREATMENT TRIALS ON CWM RHEIDOL – YSTUMTUEN MINES DISCHARGES, WALES, USING SONO-ELECTROCHEMISTRY (ELECTROLYSIS WITH ASSISTED POWER ULTRASOUND)
Bullen, C., and P. Stanley. l Proceedings from the postponed 14th IMWA Congress, "Mine Water Solutions," 2020

This publication presents the results of the 2019 Sono-electrochemistry Soneco© final pilot trials using a magnesium electrode. 90.0% of Pb, 95.7% of Zn, and 95.1% of Cd were removed within the preferred pH range of 8.8 to 9.0. A full-scale treatment plant would utilize 3.1 $kW/m^3/h$, a clarification area of 57 m^2 (enabling the lamella to fit in the existing filter beds), generating a sludge volume of 4.8 m^3/day at 2% w/w (further dewaterable by press). CapEx costs compared to a high-density sludge process has a favorable ratio of 1:3. Reducing electrode costs will make OpEx more competitive, while planned process enhancements will also lower CapEx and OpEx costs. *See* ***pages 174-180:*** https://www.imwa.info/docs/imwa_2020/IMWA_2020_proceedings.pdf

CHEMICAL TREATMENT OF HIGHLY TOXIC ACID MINE DRAINAGE AT A GOLD MINING SITE IN SOUTHWESTERN SIBERIA, RUSSIA
Bortnikova, S., O. Gaskova, N. Yurkevich, O. Saeva, and N. Abrosimova.
Minerals 10:867(2020)

The intentional displacement of mine tailings with high sulfide concentrations in the Komsomolsk settlement, Kemerovo region of Siberia, resulted in ponds of acidic water with high As (up to 4 g/L) and metals formed on the tailings. Milk of lime ($Ca(OH)_2$), sodium sulfide (Na_2S), and sodium hydroxide (NaOH) were applied to treat the toxic waters. Pre-weighed reagents were sequentially added to the solutions with control of the physicochemical parameters and element concentrations for each solution/reagent ratio during field experiments. The pH increased to neutral values the slowest when $Ca(OH)_2$ was added, contrary to the experiment results with NaOH. As-containing phases were formed most actively when neutralizing solutions with NaOH. A common specificity of the neutralization processes was rapid precipitation of Fe hydroxides and gypsum, then reverse release of pollutants under alkaline conditions. The chemistry of the processes is described using thermodynamic modeling. Full-scale experiments should use NaOH in the first stages followed by $Ca(OH)_2$ for the subsequent neutralization. https://www.mdpi.com/2075-163X/10/10/867/pdf

RESTORATION AND RISK REDUCTION OF LEAD MINING WASTE BY PHOSPHATE-ENRICHED BIOSOLID AMENDMENTS
Li, N., X. Tang, J. Yang, and Z. Sun. l Scientific Reports 11:8965(2021)

A field study was conducted to stabilize Pb using six phosphate (P)-enriched biosolid amendments in contaminated mining wastes (average of 1004 mg Pb/kg) at the Jasper County Superfund Site in Missouri. The 6 amendments included Mizzou doo compost (MD), spent mushroom compost (SMC), turkey litter compost (TLC), composted chicken litter (CCL), composted sewage sludge (CSS), and triple superphosphate (TSP). Kentucky tall fescue seeds were planted following the treatments, and soil and plant samples were collected and analyzed 8-10 years post-treatment. In all cases, the biosolid treatments resulted in significant reductions in bioaccessible Pb (96.5-97.5%), leachable Pb (95.0-97.1%), and plant tissue Pb (45.5-90.1%) in the treated wastes, as compared with the control. Treatments had no significantly toxicological effect on soil microbial community. Analysis of the Pb fractionation revealed that Pb risk reduction was accomplished by transforming labile Pb fractions to relatively stable species through the chemical stabilization reactions induced by the treatments. The solid-phase microprobe analysis confirmed the formation of pyromorphite or pyromorphite-like minerals after treatment. Among the 6 biosolid amendments examined, SMC and MD treatments were most effective in stabilizing and reducing Pb risk.
https://www.nature.com/articles/s41598-021-88576-y.pdf

PASSIVE MULTI-UNIT FIELD-PILOT FOR ACID MINE DRAINAGE REMEDIATION: PERFORMANCE AND ENVIRONMENTAL ASSESSMENT OF POST-TREATMENT SOLID WASTE
Vasquez, Y., C.M. Neculita, G. Caicedo, J. Cubillos, J. Franco, M. Vasquez, A. Hernandez, and F. Roldan. l Chemosphere [Published online 23 November 2021 prior to print]

The performance of a passive multi-unit field pilot to treat AMD from a coal mine in Colombia Andean Paramo was assessed. The multi-unit field-pilot combined a pre-treatment unit (550 L) filled with dispersed alkaline substrate and six passive biochemical reactors (PBRs; 220 L) under open (PBRs-A) and closed (PBRs-B) configurations to the atmosphere. The AMD quality was 1200 ± 91 mg/L Fe, 38.0 ± 1.3 mg/L Mn, 8.5 ± 1.6 mg/L Zn, and 3200 ± 183.8 mg/L SO_4^{2-}, at pH 2.8. The input and output effluents were monitored to establish AMD remediation. Physicochemical stability of the post-treatment solids, including metals (Fe^{2+}, Zn^{2+}, and Mn^{2+}) and sulfates for environmental contamination from reactive mixture post-treatment, was also assessed. A total removal of 74% SO_4^{2-}, 63% Fe^{2+}, and 48% Mn^{2+} in the PBRs-A, and 91% SO_4^{2-}, 80% Fe^{2+}, and 66% Mn^{2+} removal was achieved in the PBRs-B. A 99% removal for Zn2+ was achieved in both without significant differences ($p < 0.05$). A study of the physicochemical stability of the post-treatment solids showed the PBRs could produce acidic leachates capable of releasing large quantities of Fe and Mn if they are disposed of under oxidizing conditions; contact with water or any other leaching solutions must be avoided. The different PBR configurations induced changes in the performance of the passive multi-unit field pilot during AMD remediation.

Research

REMOVAL OF URANIUM FROM CONTAMINATED GROUNDWATER USING MONORHAMNOLIPIDS AND ION FLOTATION.
Hogan, D.E., R.M. Stolley, C. Boxley, M.K. Amistadi, and R.M. Maier.
Journal of Environmental Management 301:113835(2022)

Uranium contaminated groundwater (~440 µg/L U) from the Monument Valley processing site in northeast Arizona was used as a model solution to test the U removal efficacy of ion flotation with biosynthetic (bio-mRL) and three synthetic monorhamnolipids with varying hydrophobic chain lengths (Rha-C10-C10, Rha-C12-C12, and Rha-C14-C14). No U was removed from solution by any collector at the groundwater's native pH 8 and at an adjusted pH 7. At pH 6.5, bio-mRL and Rha-C10-C10 removed 239.2 µg/L and 242.4 µg/L of U, respectively. At a pH of 5.5, bio-mRL reduced the U concentration to near or below EPA's maximum contaminant level of 30 µg/L. For the Rha-C12-C12 and Rha-C14-C14 collector ligands, decreasing the pH to 7 or below reduced the foam stability and quantity, such that these collectors were not suitable to treat the groundwater. To contextual the results, geochemical analysis of the groundwater was conducted, and consideration of U speciation is described.

INTERACTIONS AMONG HEAVY METAL BIOACCESSIBILITY, SOIL PROPERTIES AND MICROBIAL COMMUNITY IN PHYTO-REMEDIATED SOILS NEARBY AN ABANDONED REALGAR MINE
Xiao, W., G. Lin, X. He, Z. Yang, and L. Wang. l Chemosphere 286(Part 1):131638(2022)

Soil samples were collected from a representative As-contaminated region undergoing phytoremediation of hyperaccumulation plants to characterize the relative abundance and diversity of microbial communities. Proteobacteria, Actinobacteria, Acidobacteria, Bacteroidetes, Gemmatimonadetes, and Firmicutes showed the highest abundance at the phylum level, accounting for >90% of the classified sequences in the soil samples. Physicochemical parameters including pH, total organic carbon, cation exchange capacity, electrical conductivity, and heavy metal concentrations, including total and bioaccessible contents in the soil samples, were determined to investigate potential relationships between microbial communities and the environmental factors. The abundances of microbial communities in the soils occurred as a result of concerted effects from all environmental factors.

ELECTROKINETIC-ENHANCED PHYTOREMEDIATION OF URANIUM-CONTAMINATED SOIL USING SUNFLOWER AND INDIAN MUSTARD

Larson, S.L., J.H. Ballard, J. Li, K. Guo, Z. Arslan, J.R. White, F.X. Han, J. Zhang, Y. Ma, and C.A. Waggoner, Army Corps of Engineers Document No. ERDC/EL MP-20-4, 14 pp, 2020

Research examined the effects of electrokinetic treatments on plant uptake and bioaccumulation of uranium in soil from various sources, including mine tailings and ore wastes around abandoned mines and U redistribution in soils affected by planting and electrokinetic treatments. Soil was spiked with 100mg/kg UO_2, UO_3, and $UO_2(NO_3)_2$. After sunflower and Indian mustard grew for 60 days, 1 voltage of direct current was applied across the soils for 9 days. U uptake in both plants was enhanced by electrokinetic treatments from soil spiked with UO_3 or $UO_2(NO_3)_2$. U accumulated more in roots than in shoots. Electrokinetic treatments were effective in lowering soil pH near the anode region. Overall, U removal efficiency reached 3.4-4.3% from soils with UO_3 and uranyl with both plants, while efficiency in soil with UO_2 was 0.7-0.8%. Electrokinetic remediation treatment enhanced U removal efficiency (5-6%) from soils with UO_3 and uranyl but was 0.8-1.3% from soil spiked with UO_2, indicating significant effects of U species and electrokinetic enhancement on U bioaccumulation. https://erdc-library.erdc.dren.mil/jspui/bitstream/11681/37237/1/ERDC-EL%20MP-20-4.pdf

ADDITION OF ORGANIC ACIDS TO ACID MINE DRAINAGE POLLUTED WETLAND SEDIMENT LEADS TO MICROBIAL COMMUNITY STRUCTURE AND FUNCTIONAL CHANGES AND IMPROVED WATER QUALITY

Aguinaga, O.E., K.N. White, A.P. Dean, and J.K. Pittman.
Environmental Pollution 290:118064(2021)

Surface sediments from a natural wetland with proven efficiency for acid mine drainage (AMD) bioremediation were artificially exposed to oxygen and/or organic carbon and incubated under laboratory conditions. In addition to measuring changes in water chemistry, a metagenomics approach was used to determine changes in sediment bacterial, archaeal, and fungal community structure and functional gene abundance. Adding organic carbon produced major changes in microorganism abundance, related to iron and sulfur metabolism, and increased levels of particulate metals via sulfate reduction. Aeration increased Sideroxydans abundance, but no significant changes in metal chemistry were observed. Results showed that utilizing organic carbon by microorganisms is more important to achieve efficient AMD treatment than oxygen availability, though combining oxygen with organic carbon did not inhibit improvements in water quality.

ANALYSIS OF PLANT AND SOIL RESTORATION PROCESS AND DEGREE OF REFUSE DUMPS IN OPEN-PIT COAL MINING AREAS

Li, X., S. Lei, F. Liu, and W. Wang.
International Journal of Environmental Research and Public Health 17:1975(2020)

Ecological stability and the process of plant and soil restoration were investigated at refuse dumps in the Wulanhada (WLHD) coal mine, the Liulingou (LLG) coal mine, and the Jinzhengtai (JZT) coal mine in Jungar Banner. Organic matter, total N, available N, and available K increased with the increase in restoration age at the WLHD and LLG coal mines. In the JZT coal mine, organic matter, total N, and available K first increased and then slightly decreased with increasing restoration age. Findings suggest that the change law of ecological stability conformed to the logistic succession model at the 3 mines. The same degree of ecological stability in different refuse dumps may correspond to different degrees of vegetation and soil development. Ecological restoration in mining areas can benefit the structure of the plant community and the recovery of soil properties, which may improve the ecological stability of coal mining areas.
https://www.mdpi.com/1660-4601/17/6/1975/pdf

SELECTIVE SEQUENTIAL RECOVERY OF ZINC AND COPPER FROM ACID MINE DRAINAGE

Passos, H., B. Cruz, N. Schaeffer, C. Patinha, E.F. da Silva, and J.A.P. Coutinho.
ACS Sustainable Chemistry & Engineering 9(10): 3647-3657(2021)

Ionic-liquid (IL)-based aqueous biphasic systems (ABSs) were proposed as an efficient alternative to selectively recover Zn and Cu from copper acid mine drainage (AMD) effluents. ABSs composed of different ILs and Na_2SO_4 were evaluated for Zn, Al, Cu, Co, and Ni extraction from both model solutions and AMD samples. IL composed of thiocyanate anion ([SCN]$^-$) presented an ability to extract metals from AMD by forming stable metal complexes. Adding NaSCN to ABSs composed of tetrabutylammonium chloride mimicked using [SCN]-based IL with additional advantages: tunable metal selectivity by the concentration of [SCN]$^-$ added to the ABS and a reduction in system cost and environmental impact. Furthermore, at the [SCN]$^-$ concentration range studied, a hydrophobic salt formed composed of IL cations and metal complex anions, which allowed for selective extraction and recovery of transition metals in a single step. The IL-rich phase recyclability in three extraction cycles was demonstrated, showing the possibility to recover two times more Zn than with a single extraction cycle while using the same amount of IL and thiocyanate. Salt-rich phases were recycled in a new IL-based ABS for subsequent Cu extraction and recovery. Results allow the development of a sustainable process to recover transition metals from AMD.

General News

INNOVATIVE STRATEGIES FOR THE MANAGEMENT OF METAL IMPACTED WATERS

Mancini, S. I REMTECH 2021: The Remediation Technologies Symposium, Banff, AB, Canada, 13-15 October, 18 slides, 2021

This presentation provides an overview of the development, design, and implementation of passive treatment technologies. Case studies on applying technologies, including in situ and ex situ treatment reactors such as Gravel Bed Reactors™ and bioreactors, phytotechnologies, constructed and engineered wetlands, pit lake in-pit treatment, and permeable reactive barriers are included. Deploying mobile treatment systems to mine sites, such as containerized columns and "wetlands on wheels," is also discussed as an important stage to facilitate treatability studies, regulatory approval, and advancement of technology application to full-scale. Each technology is discussed as a function of its implementability from a perspective of site-specific conditions, effectiveness, and expected impact on the local environment. Further, treatment system configurations, treatment mechanisms, and seasonality are explored to highlight the flexibility of their application in the context of various industry treatment needs.
https://esaa.org/wp-content/uploads/2021/10/RT21-Mancini.pdf

REVIEW OF PEER-REVIEWED DOCUMENTS ON TREATMENT TECHNOLOGIES USED AT MINING WASTE SITES

EPA Office of Superfund Remediation and Technology Innovation, EPA 542-R-20-002, 224 pp, 2021

This report identifies information related to treatment technologies being used to clean up abandoned mine lands (AMLs). Case studies examining treatment technologies used for remediating mining-influenced water (MIW) and mining wastes have been conducted at many hard rock mining sites and range in type from bench studies to full-scale field studies. Research was conducted to capture the capabilities, efficiencies, technological and site-specific requirements, and lessons learned for technologies and methods used. EPA's goals were to 1) determine trends in treatments or methods used; 2) understand successes and failures of the technologies and methods to evaluate whether there are gaps where future technologies could be developed or current ones refined; and 3) provide information in one place to aid decision of whether a given technology or method might be appropriate for use at a particular site, based on information obtained from the case studies. EPA conducted a literature search to accumulate, evaluate, and consolidate case studies that documented active or passive treatment systems or methods previously or currently used at active and inactive hard rock mining sites to remediate contaminants from various mining wastes and MIW. The media types of interest included waste rock, tailings, soil, pit lakes, water from adits, underground workings, leachate, groundwater, and surface water.
https://semspub.epa.gov/work/HQ/100002899.pdf

GUIDELINES FOR THE DESIGN OF ABANDONED MINE LAND REMEDIATION AND WATER TREATMENT

Ziemkiewicz, P.F., J. Skousen, K.D. White, B. Leavitt, and J. Stiles. US Army Corps of Engineers Environmental Restoration Development Center and the West Virginia University National Mine Land Reclamation Center, 133 pp, 2021

Originally written in 2003, this updated manual assists project design teams with environmental restoration projects in watersheds damaged by mining. The document focuses on the technical evaluation and design of remediation projects and addresses managerial issues. Off-site and on-site issues relevant to the ecosystem restoration mission are included. The goal is to bring the engineer and planner up to date with current knowledge, mindful that much remains to be learned and new strategies and technologies are being developed continually. https://wvwri.wvu.edu/files/d/cab72499-a80a-45a6-bdd1-21f801041b34/guidelines-for-aml-remediation-manual-final-15-march-2021.pdf

THE EARLY DEVELOPMENT OF PASSIVE TREATMENT SYSTEMS FOR MINING-INFLUENCED WATER: A NORTH AMERICAN PERSPECTIVE

Kleinmann, B., J. Skousen, T. Wildeman, B. Hedin, B. Nairn, and J. Gusek.
Mine Water and the Environment [Published online 15 September 2021 prior to print]

This paper reviews the first 20 years of passive treatment of mine water, from its inception as a possible way to treat small flows of circumneutral and mildly acidic coal mine drainage to its use for much larger flows and more contaminated mine water from metal mines. The original concepts of passive treatment have since been modified and used successfully to treat a wide range of mine water quality and quantities.
https://link.springer.com/content/pdf/10.1007/s10230-021-00817-8.pdf

AN APPROACH TO THRESHOLDS FOR EVALUATING POST-MINING SITE RECLAMATION

Adesipo, A.A., D. Freese, S. Zerbe, and G. Wiegleb. I Sustainability 13:5618(2021)

A time-scale conceptual threshold model to assess, evaluate, document, and monitor the reclamation progress at post-mining sites was developed beginning from initial state I_0 to degraded state D_0 (depending on the mining). Reclamation starts with soil reconstruction (R_{-2}) up to revegetation (R_{-1}, red zones) to reach the minimum threshold R_0 (amber zone). Beyond R_0 are green zones R_1, R_2, and R_3 representing soil/abiotic conditions, biological, and improved threshold. The model also identifies potential drivers, land-use options, targets, and endpoints along the threshold reclamation ladder. It can be applied to all degraded ecosystems and is adoptable in national and international laws. Future work will focus on measuring and ascribing threshold values to each stage.
https://www.mdpi.com/2071-1050/13/10/5618/pdf

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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