Entries for August 16-31, 2024

Market/Commercialization Information

F--THE PURPOSE OF THE SUPERFUND TECHNICAL ASSESSMENT (SOL)
United States Environmental Protection Agency, Region 3, Philadelphia, PA
Contract Opportunities on SAM.gov 68HE0324R0010, 2024

This is a full and open competition under NAICS code 541620. EPA Region 3 requires a contractor to support the Superfund Technical Assessment and Response Team (START) contract, which provides nationally consistent advisory and assistance services to On- Scene Coordinators (OSCs) and other federal officials implementing EPA's responsibilities under the national response system. The contractor shall fulfill these responsibilities within the region as well as outside the region on a backup regional response, cross-regional response, national response, and international response. The contractor shall be prepared to provide scientific/technical support for EPA activities in furtherance of the agency's primary mission: the protection of human health and the environment. Additionally, the contractor shall provide advisory and assistance services to other programs, such as the Superfund Pre-Remedial Program, Brownfields Program, and remedial support activities. For each assigned task, the contractor shall provide appropriately experienced, trained, and accredited personnel with current credentials/certifications, as well as all supplies, materials, tools, and equipment necessary to complete the job. The Government contemplates the award of a combination Fixed-Rate time and materials, cost reimbursable and an Indefinite Delivery Indefinite Quantity (IDIQ)/type contract resulting from this solicitation. The contract will have a period of performance of four years and six months. Offers are due by 2:30 PM EDT on October 29, 2024 https://sam.gov/opp/4479b63b79184d7196ab645a4024b0af/view

F -- FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM (FUSRAP) HAZARDOUS TOXIC RADIOACTIVE WASTE (HTRW) LABORATORY, VERIFICATION, ENVIRONMENTAL SERVICES - USACE ST. LOUIS DISTRICT (SOL)
U.S. Army Corps of Engineers, Mississippi Valley Division, St. Louis District, St. Louis, MO
Contract Opportunities on SAM.gov W912P924R0019, 2024

This is a full and open competition under NAICS code 562910. The U.S. Army Corps of Engineers, St. Louis District, is seeking a firm to provide continued support to Formerly Utilized Sites Remedial Action Program (FUSRAP) Hazardous Toxic Radioactive Waste Laboratory, Verification and Environmental Services programs managed by the St. Louis District of the USACE. The work anticipated under this contract is primarily for, but not limited to, low-level radioactive-contaminated material investigation, extent of contamination surveys, environmental assessments, on-site laboratory analysis, radiological support, removal action verification, and environmental monitoring. Radiological contaminants are primarily thorium, radium, and uranium, with co-located chemical contamination such as selenium, cadmium, and arsenic. Other services requested will be in connection with the performance of administrative recordkeeping and document management, data management, technical/regulatory integration, and project controls necessary for the execution of the St. Louis District FUSRAP. Prospective offerors should submit inquiries related to this solicitation in writing by 10:00 AM CST on September 27, 2024. The award will be a Cost Plus Fixed Fee (CPFF) and Firm-Fixed-Price (FFP) Contract with Contract Line Items. Laboratory analysis will be unit-priced by individual test. Other costs will be CPFF. Subcontracts may be issued as either FFP or CPFF. Offers are due by 10:00 AM CDT on October 21, 2024. https://sam.gov/opp/5f1f06868beb421eb515aefbf6918a71/view

R -- SOURCES SOUGHT: EPA REGION 4 START VI (SRCSGT)
U.S. Environmental Protection Agency, Region 4 Contracting Office, Atlanta, GA
Contract Opportunities on SAM.gov 68HE0P24R0007, 2024

This is a sources sought notice for market research purposes only under NAICS code 541620. EPA Region 6 is performing "market search" for large and small businesses that are interested and qualified to provide nationally consistent technical assistance services to EPA On-Scene Coordinators (OSCs) and other federal officials implementing EPA's responsibilities under the national response system for the Superfund Technical Assessment and Response Team (START) class of contracts. These services primarily support Region 4 states (AL, FL, GA, KY, MS, NC, SC, and TN) and six Tribes (Catawba Indian Nation, Eastern Band of Cherokee Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, and Seminole Tribe of Florida). Interested firms shall be prepared to provide scientific/technical support and align their activities with EPA activities to further the Agency's primary mission: The protection of human health and the environment. Contract responsibilities include providing: 24-hour, seven-days a week response activities, including emergency, counter-terrorism, oil spill, federal disaster, Potentially Responsible Party, and minor containment response, and fund-lead removals; Preparedness and Prevention Activities; Assessment/Inspection Activities; Technical Support Activities; Data Management and Mapping Support; and Training. Capability statements are due by 7:00 AM EDT on October 21, 2024. https://sam.gov/opp/79584ecef25c40d7a51bec3e9abe4614/view

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Cleanup News

SOIL HEALTH AS A PROXY FOR LONG-TERM RECLAMATION SUCCESS OF METAL-CONTAMINATED MINE TAILINGS USING LIME AND BIOSOLIDS
Ippolito, J., L. Li, T. Banet, J. Brummer, C. Buchanan, Aaron R. Betts, K. Scheckel, N. Basta, and S. Brown. Soil & Environmental Health 2(3):100096(2024)

Long-term reclamation success was quantified with respect to soils, plants, and linkages to animals at a heavy metal-contaminated alluvial mine tailing devoid of vegetation that received 224 Mg/ha of lime and biosolids. The Soil Management Assessment Framework (SMAF) with bioavailable (0.01 M CaCl 2 extractable) and plant-available (Mehlich-3 extractable) soil metal concentrations, X-ray absorption spectroscopy, plant metal concentrations, and plant quality characteristics were used to quantify reclamation success. All soil indicators were improved in reclaimed areas as compared to onsite degraded areas, including increases in soil aggregate stability, pH, plant-available P and K, soil organic C, potentially mineralizable N, microbial biomass C, and β-glucosidase activity, and decreases in soil bulk density and electrical conductivity. Unitless soil health scores were assigned based on the SMAF, with data suggesting that bulk density, wet aggregate stability, potentially- mineralizable N, microbial biomass C, pH, and electrical conductivity should be monitored in the future. The long-term effects of lime and biosolids application have improved soil physical, biological, and overall soil health. Plant metal concentrations decreased by an order of magnitude since early reclamation, with most plant metal concentrations being tolerable for domestic livestock consumption. From an animal health perspective, feeding grasses from this site during the latter parts of a growing season may need supplemental feed to provide greater protein and energy content and to reduce potentially harmful Cd concentrations from food chain bioaccumulation. However, a health concern exists based on soil bioavailable Cd and Zn concentrations that exceed ecological soil screening levels. Still, plants have stabilized the soil and acidity remains neutralized, leading to long-term improvements in soil health and overall improved ecosystem health.

CASE STUDY – THE GLADDEN ACID MINE DRAINAGE (AMD) TREATMENT FACILITY AND FISHING RUN STREAM SEALING PROJECT
Wood, K. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 25 slides, 2024

The Gladden Acid Mine Drainage (AMD) Treatment Facility located on Millers Run is designed to treat 2.2 million gpd (8,328 m^3/d) and remove 690 lb/d (313 kg/d) of iron pollution, eliminating one of the largest discharges in the watershed and restoring water quality to four miles of Millers Run and three-and-one-half miles of Chartiers Creek. The discharge, which ranges from 750 to 1,500 gpm (3 to 6 m^3/min), originates from the abandoned Pittsburgh Coal Company's Montour No. 2 underground mine. The plant extracts AMD from the mine pool and pumps it to the surface for treatment, which consists of aeration, oxidation with hydrogen peroxide, and alkaline addition as needed. Iron is precipitated and settles in a clarifier, and is then routed through a polishing pond before final discharge to Millers Run. The iron sludge is pumped from the clarifier via a pipeline where it is injected into a distant section of the mine for disposal. The plant treats ~ 387,000 lb (175,540 kg) of iron annually. Since the plant became operational, additional work has been completed to address surface infiltration. An investigation determined that flow loss of the upper parts of Fishing Run and an unnamed tributary to Millers Run were entering the Montour No. 2 Mine. A sealing project eliminated surface water infiltration by installing a geosynthetic clay liner and grouting the strata beneath the stream bottom using a two-part component polyurethane grout injection on over 6,000 linear ft (1,829 m) of stream. Increased flow has been measured in some sections of the restored stream channel, but additional areas have been identified within Fishing Run where flow loss is still occurring. The stream sealing resulted in a ~60% decrease in mine water being treated. The average pumping rate decreased from 1,400 gpm (5.3 m ^{3}/min) to 600 gpm (2.3 m^3/ min). Reducing the inflow into the mine maximized the effectiveness of the plant and helped reduce operating costs.
Slides: https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-a-830-wood-the-gladden-acid-mine-drainage-treatment-facility.pdf
Longer Abstract: https://www.imwa.info/docs/imwa_2024/IMWA2024_Wood_652.pdf

PASSIVE TREATMENT USING DRAINABLE LIMESTONE BEDS: LESSONS FROM 14 YEARS OF DESIGN AND MAINTENANCE
Wolfe, N., R. Hedin, B. Hedin, and O. Weaver. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 25 slides, 2024

Since 2010, six Drainable Limestone Beds (DLBs) have been installed in Pennsylvania to remove Fe, Al, and Mn and discharge good-quality water. The Greene DLB is subject to an NPDES discharge permit while the Lotus DLB feeds a fish pond in a botanical garden. The long-term effectiveness of the systems depends partly on managing the solids formed in the beds. Studies of the effectiveness of draining events have found removal of 25-70% of the Al solids, depending on the chemistry and plumbing design. This solids management is suitable for preserving the bed permeability and reactivity for many years. Eventually, the beds accumulate enough solids that cannot be removed through draining that maintenance is required to sustain satisfactory treatment performance. Maintenance typically involves rehabilitation or replacement of the limestone at variable frequencies. Rehabilitation is increasingly preferred over limestone replacement. The limestone aggregate in the beds is mechanically mixed using excavation equipment and rinsed with water to remove accumulated metal solids, which increases porosity and reactivity at a fraction of the cost of aggregate replacement. Solids produced by draining and cleaning are captured in settling ponds. Ultimately, these solids must be removed from the settling ponds for disposal. Developing solids disposal methods is a reasonable next step in the evolution of this treatment technique.
Slides: https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-d-1015-wolfe.pdf
Longer Abstract: https://www.imwa.info/docs/imwa_2024/IMWA2024_Wolfe_645.pdf

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Demonstrations / Feasibility Studies

PASSIVE TREATMENT OF MN: RESULTS FROM AN EXPERIMENTAL PILOT SYSTEM
Hedin, B., N. Wolfe, and R. Hedin. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 4 pp, 2024

A project investigated Mn removal by 19 existing, full-scale passive treatment systems and two experimental, pilot-scale oxic aggregate beds. All full-scale passive systems removed Mn, but only one removed Mn below 0.3 mg/L. The Hollywood and Brandy Camp pilot-scale units received Mn-contained effluent from the systems. The Hollywood system treats low-pH mine drainage with hydrated lime and polymer; metals are settled in a concrete clarifier. The Brandy Camp system treats low-pH mine drainage with hydrogen peroxide, polymer, and lime slurry; metals are settled in a series of ponds followed by a wetland. The Hollywood unit contained 33 t of Mn oxide-coated limestone from an operational passive Mn removal system. The Brandy Camp pilot contained 11 tonnes of limestone from a local quarry. Experiments were conducted by varying flow rates and measuring influent and effluent chemistry. The Hollywood unit received circumneutral water containing an average of 0.6 mg/L dissolved Mn and 1.5 mg/L particulate Fe and was operated for 10 months. The Brandy Camp unit received circumneutral water containing an average of 5.8 mg/L dissolved Mn and 1.7 mg/L particulate Fe and was operated for 12 months. Both systems decreased Mn to <0.3 mg/L Mn. However, the kinetics of Mn removal, determined from changes in Mn concentration and theoretical retention times, differed substantially. The Brandy Camp pilot unit removed Mn to a lower concentration and faster rate than the Hollywood pilot unit. Both the physical and biological differences of the systems are likely important. Physically, the Brandy Camp unit contained smaller aggregate with about five times more surface area than the Hollywood pilot or full-scale passive systems. Biologically, the Brandy Camp unit was preceded by a wetland, which may provide nutrients to microbes involved in Mn removal, whereas a concrete clarifier preceded the Hollywood unit. The rapid and consistent Mn removal by the Brandy Camp system shows the opportunity for optimized passive Mn removal. The Brandy Camp unit consistently met the 0.3 mg/L Mn effluent standard at 1/10 to 1/20th of the retention time of existing passive treatment systems.
Paper: https://www.imwa.info/docs/imwa_2024/IMWA2024_Hedin_264.pdf
Slides: https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-d-100-hen-hedin-et-al-imwa-2024-passive-mn-removal.pdf

GENERATING RARE EARTH ELEMENT AND CRITICAL MINERAL HYDRAULIC PRE-CONCENTRATE FROM ACID MINE DRAINAGE AT REMOTE SITES: A CASE STUDY AT FOLA JOB 5, CLAY COUNTY, WV
Santos, I., N. DePriest, D. Hoffman, C. Glascock, R. Spirnak, J. Fillhart, M. King, J. Quaranta, and P. Ziemkiewicz. Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 6 pp, 2024

The West Virginia Water Research Institute (WVWRI) investigated recovering rare earth elements (REEs) and critical minerals (CMs) from mining byproducts, including sludges generated by the treatment of acid mine drainage (AMD). As a result of a successful investigation, WVWRI is expanding its operations to create a national REE/CM feedstock supply chain. The first step is treating AMD to generate REE/CM-enriched sludge, known as hydraulic pre-concentrate (HPC). In Appalachia, a large portion of AMD is generated at remote sites where AMD must be treated passively without a power supply. This research investigated the feasibility of producing HPC following Patent No. US 10,954,582 B2 (https://patentimages.storage.googleapis.com/e8/b2/c8/aa978cb28d7d7c/US10954582.pdf) at a remote AMD site with a flow rate of < 50 gpm (190 L/min). The research intended to design, deploy, and operate a system capable of treating AMD in compliance with NPDES limits while generating HPC. A demonstration system was constructed at a remote site in Clay County, WV. The deployed system achieved steady-state flow with effective pH control. Samples were collected to assess the system's REE/CM recovery performance in the resulting HPC product. Analytical results revealed an impressive REE recovery rate of 85% and CM recovery rate of 83%, indicating substantial potential for profitability.
Paper: https://www.imwa.info/docs/imwa_2024/IMWA2024_Santos_546.pdf
Slides:https://wvmdtaskforce.com/wp-content/uploads/2024/05/thursday-santos.pdf

IN SITU USE OF MINING SUBSTRATES FOR WETLAND CONSTRUCTION: RESULTS OF A PILOT EXPERIMENT
Hernandez-Perez, C., S. Martínez-Lopez, M.J. Martínez-Sanchez, L.B. Martinez-Martinez, M.L. Garcia-Lorenzo, and C.P. Sirvent. I Plants 13(8):1161(2024)

An experimental wetland was evaluated as part of a pilot soil reclamation project in a mining area. The wetland was constructed using materials of mining origin from the area; most reactive materials of acid pH were stabilized using limestone filler. Macrophytes tolerant to potentially toxic elements (PTEs) and resistant to salinity were selected, including *Phragmites australis*, *Juncus effusus*, and *Iris pseudacorus*. These macrophytes were then placed in pots containing substrates composed of different mixtures of topsoil, peat, and mining waste (black or yellow sand). A thorough analysis of the physicochemical and mineralogical characteristics of the materials included studies of PTE mobilization. This study emphasizes the significance of the rhizosphere in directing the transfer of PTEs to the plant and the correlation between the substrate and the development of plant defense mechanisms, such as the formation of Fe-plates. Scanning electron microscopy was used to highlight these aspects and validate the results of the analytical determinations. The wetlands can be used as a phytoremediation strategy for areas affected by mining and maritime influence. They are easy to construct and remain stable, providing important ecosystem services such as the natural attenuation of acid mine drainage, support for vegetation development and fauna, and a clean ecosystem. *This article is* ***Open Access*** *at* https://www.mdpi.com/2223-7747/13/8/1161

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Research

GEOPHYSICAL CHARACTERIZATION OF MINE INFLUENCED GROUNDWATER AND SURFACE WATER IN THE MAYFLOWER SECTION OF THE ANIMAS RIVER, BONITA PEAK MINING DISTRICT, SILVERTON COLORADO
Werkema, D., N. Terry, and B. Trottier. EPA/600/R-23/340, 41 pp, 2024

This report details findings from geophysical investigations to identify possible groundwater-surface water interaction zones and potential metal loading from mine-influenced water near the Mayflower Section of the Animas River in Silverton, Colorado. The investigation utilized electromagnetic induction, magnetic, and fiber optic distributed temperature system geophysical methods to measure the bulk earth electrical conductivity, magnetic susceptibility, and temperature of specific surveyed volumes of the Earth. Right and left bank characterization was separated for each method, indicating more groundwater entering from the right bank than the left bank. The predominantly right bank discharges potentially contain metal-rich water compared to the left bank. Results also indicate mineral veins facilitate preferential groundwater discharge to the river due to possible jointing, fractures, and permeability differences, sometimes occurring along veins relative to host rock. For example, the beaver ponds near Blair Gulch may influence groundwater discharge. Mayflower Impoundment #4 is potentially impacting groundwater and surface water and may be connected to the wetlands west of the impoundment. These data could be further analyzed for smaller spatial scale analysis within areas of interest and can be used by site investigators, decision-makers, and stakeholders in mitigation decisions and strategies.
https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=549606&lab=CPHEA

BIOREMEDIATION OF ACID MINE DRAINAGE USING SULFATE-REDUCING WETLAND BIOREACTOR: FILLING SUBSTRATES INFLUENCE, SULFIDE OXIDATION AND MICROBIAL COMMUNITY
Wang, H., M. Zhang, P. Dong, J. Xue, and L. Liu. Chemosphere 349:140789(2024)

Two sulfate-reducing wetland bioreactors (SRB-1 filled with lignocellulosic wastes and SRB-2 with river sand) were applied to treat synthetic acid mine drainage using bio-waste fermentation liquid as electron donor and investigate the influence of filling substrates on sulfate reduction, sulfur transformation, and microbial community. Lignocellulosic wastes (mixture of cow manure, bark, sawdust, peanut shell, and straw) in SRB-1 promoted sulfate reduction efficiency (68.9%), sulfate reduction rate (42.1 ± 11 mg S/(L·d)), and dissolved sulfide production rate (27.4 ± 7 mg S/(L·d)), and caused a high conversion ratio of sulfate reduction into dissolved sulfide (66.4%). A relatively low sulfate reduction efficiency (42.9%), sulfate reduction rate (27.0 ± 10 mg S/(L·d)), dissolved sulfide production rate (5.6 ± 3 mg S/(L·d)), and low dissolved sulfide conversion efficiency (21.2%) occurred in SRB-2. Mixed organic substrates, including easily assimilated electron donors (in manure) and lignocellulosic matter, effectively promoted quick start and long-term microbial sulfate reduction. More than 98% of produced dissolved sulfide was oxidized dominantly by photoautotrophic green sulfur bacteria (genera *Chlorobium* and *Chlorobaculum*), of which 64.6% and 54.5% were converted into elemental sulfur for SRB-1 and SRB-2. Sulfide oxidation into elemental sulfur for potential recovery rather than sulfate is preferred. Diverse sulfate-reducing and sulfide-oxidizing bacteria co-existed in the treatment system, leading to a sustainable sulfur transformation. High metal Fe (99.6%, 92.5%), Cd (99.9%, 99.9%), Zn (99.4%, 98.5%), and Cu (94.5%, 94.6%) removal efficiency was achieved. Effluent pH increased to 6.5-7.7 and 6.7-7.7 for SRB-1 and SRB-2. The microbial community was regulated by filling substrates. Synergism between lignocellulosic decomposing bacteria and sulfate-reducing bacteria played a vital role in the lignocellulosic bioreactor treating AMD, and fermentation liquid effectively served as an electron donor.

EFFECTS OF ACID MINE DRAINAGE ON PHOTOCHEMICAL AND BIOLOGICAL DEGRADATION OF DISSOLVED ORGANIC MATTER IN KARST RIVER WATER
Li, L., X. Cao, C. Bu, P. Wu, B. Tian, Y. Dai, and Y. Ren.
Journal of Environmental Sciences 135:26-38(2024)

A study was conducted to reveal the evolution processes of dissolved organic matter (DOM) under photochemical and biological conditions in acid mine drainage (AMD)-impacted karst river water (KRW). AMD and KRW were mixed in different ratios under conditions of visible light irradiation (VL), biodegradation (BD), ultraviolet irradiation (UV) and ultraviolet irradiation + biodegradation (UV+BD). After mixing AMD and KRW in different proportions, the average DOC concentrations in samples decreased significantly (by 23%) in UV+BD, which was 1.2-1.4 times higher than under the other conditions, and would lead to a significant release of inorganic carbon. Further analysis of the fluorescence parameters via parallel factor analysis revealed that the DOM fluorescence components in AMD comprised mainly protein-like substances derived from autochthonous components. The DOM fluorescence components in KRW were mainly humic-like substances with both autochthonous and allochthonous sources. Therefore, AMD could promote the photochemical and biological degradation of DOM in karst-receiving streams, converting DOC to inorganic carbon. Results showed that the synergistic effects of UV+BD and AMD accelerated the degradation of DOM and the release of inorganic carbon in KRW, thus affecting the stability of the karst carbon cycle.

AN INNOVATIVE METHOD TO DEGRADE XANTHATE FROM FLOTATION TAILINGS WASTEWATER IN ACID MINE DRAINAGE (AMD) SYSTEM: PERFORMANCE, DEGRADATION MECHANISM AND PATHWAYS
Yuan, J., Z. Ding, J. Li, A. Yu, S. Wen, and S. Bai.
Journal of Environmental Management 349:119395(2024)

A study aimed to degrade xanthate from flotation tailings wastewater using a coagulation-flocculation co-Fenton oxidation process in an acid mine drainage (AMD)-H_2O_2 system. A >98% sodium butyl xanthate (SBX) removal rate was achieved under optimal conditions. The acids and Fe^{2+} in AMD were sufficient to initiate a Fenton reaction with the aid of H_2O_2. Iron ions were reduced to 0.19 mg/L by participating in an oxidation process. The Cu^{2+} ions in AMD facilitated the coagulation-flocculation process. Comparison experiments confirmed that the method was superior to AMD (54.26%) or H_2O_2 alone (32.23%) in degrading SBX. SBX degradation followed a pseudo-first-order kinetic model. Hydroxyl radicals (•OH) were the main active species in the AMD- H_2O_2 system. Degradation products were analyzed, and two possible pathways of SBX degradation were proposed: 1) the SBX was first transformed into butyl xanthate peroxide, CO_3^{2-} and $S_2O_3^{2-}$, then further decomposed into CO_2, H_2O, and SO_4^{2-} under the ongoing •OH attack; and 2) that butyl copper xanthate and iron oxide species precipitates were generated during the SBX degradation.

THE ENGINEERING OF TRULY PASSIVE MINE WATER TREATMENT SYSTEMS USING RECYCLED CONCRETE AGGREGATE
Brown, A. | Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 6 pp, 2024

A five-year study evaluated recycled concrete aggregate (RCA) technology to understand why the sustainable material has yet to fulfill its potential to treat AMD. The reasons include: 1) the AMD has been passed through the RCA too rapidly; 2) the RCA particle size was too large; and 3) the treatment systems' hydraulics are too complex and active. Quantifying the requirements for successful site-specific long-term passive RCA treatment systems showed: 1) Small RCA particle size to allow the timed-release of alkalinity from the RCA, in the order of 5-10 mm; 2) Large RCA void volume to allow AMD retention required for treatment and filtration, in the order of 1 to 15 days for this particle size; and 3) sufficiently simple upflow treatment hydraulics, ideally without pumps or pipes. The paper supports these guidelines and sets out instructions to successfully test, design, and engineer a passive, long-term, and sustainable AMD treatment system at any site using RCA as the treatment, sequestration, and filtration medium.
Paper: https://www.imwa.info/docs/imwa_2024/IMWA2024_Brown_59.pdf
Slides: https://wvmdtaskforce.com/wp-content/uploads/2024/05/imwa-2024_adrian-brown-engineering-amd-treatment-with-rca-11-short-form-complete.pdf

LARGE-SCALE FOREST RESTORATION GENERATES COMPREHENSIVE BIODIVERSITY GAINS IN AN AMAZONIAN MINING SITE
Gastauer, M., T. Pinheiro, C.F. Caldeira, S.J. Ramos, R.R. Coelho, D.S. Fonseca, L. Tyski, A.L. de Rezende Cardoso, C. de Sa Carvalho Neto, L. Guimaraes, and P.S. de Medeiros Sarmento.
Journal of Cleaner Production 443:140959(2024)

Biodiversity changes linked to implementing the S11D Eliezer Batista iron mining Complex were assessed in the Carajas National Forest, Para state, Brazil, expecting losses from mining activities and gains through forest restoration offsets. Biodiversity stocks were evaluated based on Biotic Value as the product of habitat importance and actual conditions. Habitat importance, a unique value for each class of land cover recognized within the study site, was based on evaluating habitat naturalness, rarity and endangerment, and substitutability. Actual conditions were computed from field-surveyed key ecological attributes of vegetation structure, community composition, and diversity. Ecological processes and forest restoration activities could restitute ~73 % of old-growth forest conditions within 4-6 years. The Biotic Value ranges from 0 for mine lands to 1 for patchy savanna formations stocking above ironstone outcrops (cangas) and amounts to 0.43 units/ha for secondary forests. Comprehensive land-use changes were detected in the study area: cangas, farmlands, and old-growth forests decreased, while secondary forests and mine lands increased considerably. Despite environmental degradation, secondary forest emergence contributed to a positive biodiversity balance within the areas managed by the mining company (+379 units), while biodiversity losses dominated outside the company's boundaries (-171 units). Although like-for-like compensation of canga impacts remains challenging, forest restoration efforts initiated by the mining company effectively reversed the trajectory of environmental degradation prevailing in the landscape. They provided considerable biodiversity gains for the region.

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General News

REVITALIZING CONTAMINATED LANDS: A STATE-OF-THE-ART REVIEW ON THE REMEDIATION OF MINE-TAILINGS USING PHYTOREMEDIATION AND GENOMIC APPROACHES
Hassan, S., S.S. Bhadwal, M. Khan c, Sabreena, K.-U. Nissa, R.A. Shah, H.M. Bhat, S.A. Bhat, I.M. Lone, and B.A. Ganai. | Chemosphere 356:141889(2024)

This review explores the growing prominence of phytoremediation and metagenomics as ecologically sustainable techniques to rehabilitate mine tailings. The study envisages that plant species, such as *Solidago chilensis*, *Festuca arundinacea*, *Lolium perenne*, *Polygonum capitatum*, *Pennisetum purpureum*, *Maireana brevifolia*, and *Prosopis tamarugo*, could be utilized to remediate mine tailings. A critical evaluation of the organic and inorganic amendments that optimize conditions for the remediation of mine tailings is also provided.

USING STATE POINT ANALYSIS AND SETTLING FLUX THEORY TO DESIGN AND OPERATE MINE WATER TREATMENT CLARIFIERS
Schreiber, H., J. Stanley, and M. Chambers. | Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 7 pp, 2024

State point analysis is an analytical, graphical tool widely used to optimize clarifier and system performance in biological activated sludge processes. The process recirculates clarifier underflow to the upstream aeration basin to increase biomass concentration. State point analysis helps determine solids distribution between the clarifier and aeration basin, which is critical since the clarifier and biological process performance is highly dependent on solids loading and concentration. In mine water treatment processes, concentrated clarifier underflow is often recycled to upstream reaction or flocculation tanks to improve reaction kinetics and flocculation. Similarity to the activated sludge process in this regard allows expansion of the state point analysis concepts to many mine water treatment processes. Applying the state point concept and settling flux theory allows for a better understanding of clarifier sizing and operation in mine water treatment processes.
Paper: https://www.imwa.info/docs/imwa_2024/IMWA2024_Schreiber_564.pdf
Slides: https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-a-1015-schreiber-using-state-point-analysis.pdf

CRITICAL MINERALS: WHAT ARE THEY, WHY ARE THEY CRITICAL, AND WHAT IS EPA'S INVOLVEMENT WITH RESPECT TO THEM
Butler, B., J. McKernan, and Rick Wilkin.
Central and Eastern European Conference on Health and the Environment, 15-19 July, Thessaloniki, Greece, 24 slides, 2024

This research overview provides a definition and background of the importance of Critical Minerals (CMs) to the U.S. EPA's intra-agency and cross-department efforts. EPA's key involvement areas are described and linked with other agencies and departments. ORD's strategic research action plan is highlighted, and specific research in mineral recovery technologies is discussed. Initial research results are also described. One of the conclusions is identifying unconventional sources (like mine waste) as an avenue to support and promote a domestic supply chain; however, more research is needed before the utilization of mine waste as a source becomes widespread. Next steps include: 1) building on the information presented in this report to confirm potential sites where critical minerals may be present; 2) quantifying the concentration and availability of critical minerals on contaminated sites in EPA's portfolio; and 3) considering the adaptability of existing and developing technologies to site-specific conditions and constraints.
https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=362233&Lab=CESER&simplesearch=0&showcriteria=2&sortby=pubDate&timstype=&datebeginpublishedpresented=06/15/2019&searchall=remediation

35 YEARS OF LESSONS LEARNED DESIGNING, BUILDING, AND MONITORING PASSIVE TREATMENT SYSTEMS FOR MINING INFLUENCED WATER (PART 1)
Gusek, J.J. | Minerals and Mineral Materials 3:2(2024)

This review presents case histories that reflect a mining engineer's learning experiences in passive treatment system design, construction, and operation. Most case studies are from bench- and pilot-scale testing programs, reinforcing the benefits of small-scale testing as an economical way to accumulate valuable lessons learned experience with minimum risk. Key takeaways from lessons learned:

- Biochemical reactors (BCRs) can be overloaded, but only for a short time to avoid permanent harm to the microbial community.
- Other metal removal processes can substitute for sulfate reduction in overloading situations, but the beneficial effects may be reversible.
- Media material substitution risk in full-scale construction can be lessened if bench or pilot data is available.
- BCRs are feasible in cold climates.
- The age of woody material (fresh vs. moldy) in BCR media is inconsequential.
- Allow plants to grow on BCR surfaces with caution.
- Excessive aluminum concentrations do not cause BCR media to plug.
- Metal adsorption to manganese oxide coatings may be a viable alternative to sulfide precipitation in BCRs.
- Mixing bypassed mining-influenced water with BCR effluent may offer benefits in a freshet.v
- A test failure may be due to an improper design, and the passive treatment concept should not be condemned.
- Avoid deviating from the bench- or pilot-scale test conditions in final design and construction.

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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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