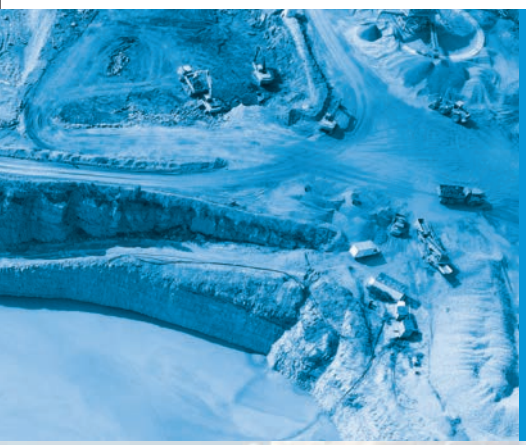
A Total Solutions Provider

ENVIROGEN TECHNOLOGIES



Solutions for Mining Wastewater Treatment

Solving the most challenging water treatment problems

Meeting the most stringent water discharge limits

Envirogen Technologies, Inc. is an environmental technology and process solutions provider that combines experience in water and air treatment with process development and O&M expertise – delivering long-term, guaranteed solutions for a broad range of treatment and process-related applications. We pride ourselves in delivering superior 'lifecycle performance' by offering long-term, guaranteed, pay-for-performance contracts that produce the lowest total cost over the lifetime of an installation.

Trust The Experts With Your Mining Wastewater Compliance Needs

Mining operations are under scrutiny by regulators, environmental and citizen groups to comply with water discharge limits for a wide range of contaminants. Envirogen has extensive experience in mining water treatment to solve these complex water related issues. We offer:

1. Solutions for treatment of suspended solids, metals, organics, inorganics, and pH adjustment
2. A broad technology toolbox coupled with a wealth of in-house engineering expertise to deliver best solutions for your specific issues
3. Integrated, packaged systems from one vendor
4. Consultative approach
5. 30+ years of experience in solving the most difficult wastewater treatment problems
6. Over 100 installations in North America
7. Design, installation, commissioning and operations & maintenance expertise

Envirogen Solutions For Mining Wastewater

Envirogen excels at selecting the right mix of technologies to solve very specific application requirements. Unlike other wastewater treatment providers who may steer you towards their in-house technology, Envirogen studies the application details, offering the most effective solution with the lowest life-cycle cost.

As provided in Table 1, there are clearly numerous treatment technologies that can address a particular problem. However, understanding the influent concentrations, variations in loading rates, presence of other impactful contaminants, permitted discharge limits, etc., drives the selection of the optimum treatment plan.

Table 1 – Solutions Offered for Mining Wastewater

	Solutions														
Problem/Contaminant		Greensand	Advanced Metals Removal System*	Multi Media Filtration	Clarifier	Oxidation	Chemical Treatment	IX Resin	RO/NF	Fluidized Bed Reactor Biological Treatment	Membrane Bio Rector	Moving Bed Bio Reactor	Activated Carbon	High Perf Adsorbant Media (HPA)	Dissolved Air Flotation
	Selenium		■					■		■					
	Manganese	■					■	■							
	Iron	■				■	■	■							
	Nitrates							■		■	■	■			
	Chromium		■					■		■					
	Suspended Solids/Sediment			■	■										■
	Arsenic		■				■	■		■					
	Radium							■							
	Uranium		■					■							
	Organics				■				■	■	■	■	■	■	
	Phosphate							■	■					■	
	Heavy Metals (other)		■		■		■	■	■	■	■	■			
	BOD									■	■	■	■		
	Ammonia					■		■	■	■	■				
	Chlorides								■						
	Acidic pH						■								

* Featuring Zero Valent Iron Technology

How Envirogen Develops Custom Tailored Solutions

Highlight Application - Selenium

As a demonstration of Envirogen's capabilities, the following details how Envirogen has solved the problem of selenium contamination for numerous mining, refining, and power applications. Specifically, a three pronged solution was employed:

1. Primary selenium reduction using Envirogen's proprietary Fluidized Bed Biological Reactor (FBR)
2. Polishing selenium reduction (where required to meet lower permit limits) using Envirogen's Advanced Metals Removal System (AMRS)
3. Solids removal using downstream liquid/solids separation (filtration)

Key Technologies Employed and Advantages Delivered

For the selenium application, Envirogen considered a variety of possible solutions and selected the best performing solution with lowest lifecycle-cost:

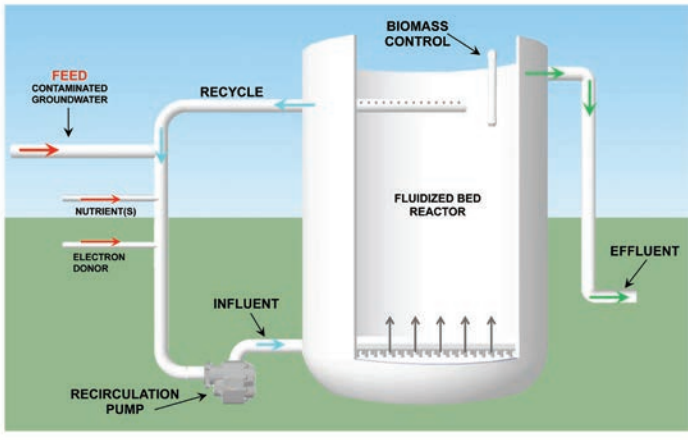
Step 1 - Fluidized Bed Reactor – The fluidized bed reactor (Figure 1) is an active, fixed-film bioreactor that fosters the growth of microorganisms on a fluidized bed of fine granular media (typically sand or granular activated carbon). By fluidizing the bed, the full media surface area is available for microbiological growth as a thin film, reducing mass transfer limitations, eliminating bed channeling and offering high volumetric efficiency. Microbes are fed nutrient, and with the addition of an electron donor to the system, selenate and selenite are biologically reduced to insoluble selenium that is readily removed along with biomass and other suspended solids by downstream liquid/solids separation.

FBR installations typically feature one or more vessels in single- or two-stage configurations, depending on influent water characteristics and discharge limits. Prefabricated FBR vessels from 2 to 18.5 feet in diameter and up to 32-feet in height are available – offering very deep beds in comparison to packed bed technology. This vertical orientation is also one of the factors that contribute to the FBR's smaller footprint.

Fluidized Bed Reactor Advantages

- Very small system footprint due to shorter hydraulic residence time requirements
- Ability to treat higher selenium concentrations
- Steady-state performance
- Does not plug up or channel like packed bed systems
- Tolerant of high feed TSS and metals
- Quick recovery from upsets such as power outages or loss of chemical feeds
- Lower capital cost – up to 65% less than alternative traditional technologies
- Flexibility in handling variable & high flow rates
- Lower cost of operation
- "Green" treatment technology

Figure 1 – Fluidized Bed Reactor Schematic



Step 2 - Advanced Metal Removal System (AMRS) – For applications with very low effluent limits, a polishing step can be implemented using Envirogen Advanced Metals Removal System (AMRS) featuring zero valent iron Technology. This engineered adsorptive material can achieve non-detect levels of selenium in the effluent. The AMRS media has extremely high porosity, surface area, and reactivity, therefore providing exceptional adsorptive capacity.

Advanced Metal Removal System Advantages

- High porosity and large surface area (>100x surface areacompared to normal ZVI)
- High reactivity (>10x compared to normal ZVI)
- Higher contaminant adsorption capacity

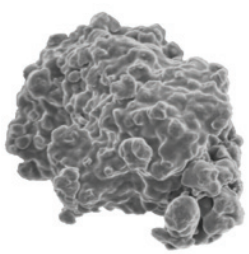
Step 3 - Solids Removal – In most installations, a liquid/solids separation step is selected specifically to match the stream chemistry and effluent requirements. Options for liquid solids separation include coagulation and filtration, clarification, membrane separation, and dewatering with a filter press. Envirogen has tested and qualified numerous filtration systems and will recommend the optimum solution for your application. For selenium treatment applications, one effective solution has been shown to be membrane filtration.

Membrane Filtration System Advantages

- Positive retention of reduced selenium
- Biological polishing of the FBR effluent with reduction of trace selenium residuals
- Elimination of coagulant chemicals and polymers
- Substantial reduction in biosolids generation due to longer residence times
- No further requirement to thicken filter backwash
- Possible flexibility for the future treatment of other regulated contaminants that may be at issue such as phosphates or metals (Zn, Cr, Hg, Cd, etc.)
- Smaller footprint

Figure 2

Competing Zero Valent Iron Media



Cleanit Zero Valent Iron Media

Why Envirogen For Mining Operations?

High Profile Projects – We have extensive experience working on projects in the mining industry where there is a high level of scrutiny from regulators, public advocacy groups and the media.

Our Team Approach – We have extensive experience with the design, installation, startup and O&M of numerous types of physical, chemical and biological treatment systems. Our approach includes close integration of in-house process and mechanical engineering staff with experienced operators, electricians, and mechanics. We also offer geotechnical engineering services for preparation of dewatering plans to support excavation contractors.

Collaborative and Flexible – We have worked directly for, and with, mining operations, potentially responsible parties (PRPs), contractors and EPCM firms. Each project has unique aspects, and we have a demonstrated ability to work well as part of a team that focuses on safety and compliance.

Compliance with Stringent Permit Limits – Many mining sites have discharge permits that have stringent effluent limits for parameters such as metals (particularly arsenic, thallium, mercury and selenium), ammonia-nitrogen, and organics. Envirogen specializes in handling difficult-to-treat waters with strict effluent permit limits.

Lowest Life-Cycle Cost – Our integrated project delivery approach provides the lowest life-cycle cost in a manner that addresses cost control along with safety, excellent run time and compliance with discharge permit limits.

Redundancy in Design – Our systems include redundant equipment and instrumentation, e.g. pumps, level controls, alarms and ancillary systems. Our goal is 100% run time with down time limited to planned maintenance shutdowns.

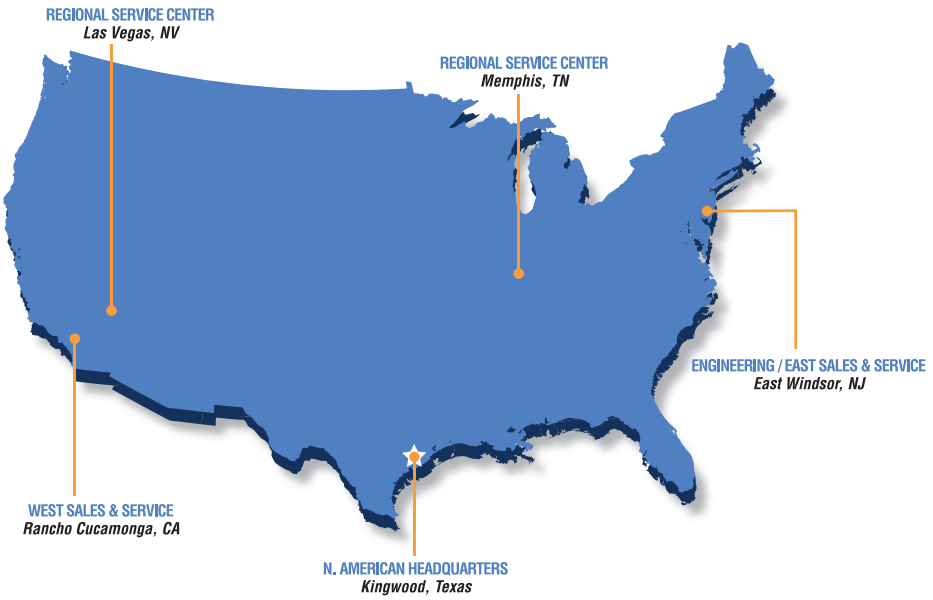
One-Stop Shop – Envirogen can provide complete system design, equipment selection, equipment integration and O&M services, as well as support and/or complete turnkey supply of construction, installation, and commissioning.

At The Forefront Of Mining Wastewater Solutions

Envirogen has the breadth of experience, proven technologies, and extensive operating experience to solve the most difficult water treatment problems for mining operations. Rely on Envirogen to analyze your needs, and specify the most effective and economical solution to address the most stringent water discharge limits. Performance guarantees are offered in conjunction with our Operations and Maintenance contracts to provide additional peace of mind. Our extensive reference list over the past 30 years provides the assurances you need to choose the industry leader in treating difficult wastewater.

Envirogen has offices throughout the United States. Our regional offices located in East Windsor, NJ and Memphis, TN provide technologies, equipment and services to utilities, companies and public sector entities located in the United States. Our service centers in Rancho Cucamonga, CA and Las Vegas, NV primarily service the western United States and Canada - see Figure 3.

Figure 3 – Envirogen North American Locations



North American Headquarters
2627 Chestnut Ridge Rd., Suite 260
Kingwood, TX 77339

Wester US and Canada Sales & Service
9360 Santa Anita Avenue, Suite 107
Rancho Cucamonga, CA 91730

Engineering/East Sales and Service
84A Twin Rivers Drive
East Windsor, NJ 08520

Regional Service Center
2070 Airways Blvd.
Memphis, TN 38114

ENVIROGEN TECHNOLOGIES

Toll-free: 877-312-8960
E-mail: info@envirogen.com
www.envirogen.com