Industrial Stormwater

Fact Sheet Series

Sector G: Metal Mining (Ore Mining and Dressing) Facilities

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What is the NPDES stormwater permitting program for industrial activity?

Activities, such as material handling and storage, equipment maintenance and cleaning, industrial processing or other operations that occur at industrial facilities are often exposed to stormwater. The runoff from these areas may discharge pollutants directly into nearby waterbodies or indirectly via storm sewer systems, thereby degrading water quality.

In 1990, the U.S. Environmental Protection Agency (EPA) developed permitting regulations under the National Pollutant Discharge Elimination System (NPDES) to control stormwater discharges associated with eleven categories of industrial activity. As a result, NPDES permitting authorities, which may be either EPA or a state environmental agency, issue stormwater permits to control runoff from these industrial facilities.

What types of industrial facilities are required to obtain permit coverage?

This fact sheet discusses stormwater discharges from metal mining (ore mining and dressing) facilities as defined by Standard Industrial Classification (SIC) Major Group 10. Metal mining is defined here as all ore mining and/or dressing and beneficiating operations performed at mills operated in conjunction with the mines served or at mills (i.e., custom mills) operated separately. Facilities and products in this group fall under the following categories, all of which require coverage under an industrial stormwater permit if discharges of stormwater have come into contact with any overburden, raw material, intermediate products, finished product, byproduct or waste products located on the site of such operations:

- Iron Ores (SIC 1011)
- Copper Ores (SIC 1021)
- Lead and Zinc Ores (SIC 1031)
- Gold Ores (SIC 1041)
- Silver Ores (SIC 1044)
- Ferroalloy Ores, Except Vanadium (SIC 1061)
- Uranium-Radium-Vanadium Ores (SIC 1094)
- Miscellaneous Metal Ores, Not Elsewhere Classified (SIC 1099)

Permit coverage is required of all phases of mining operations, whether active or inactive, as long as there is exposure to significant materials. This includes land disturbance activities such as the expansion of current extraction sites, active and inactive mining stages, and reclamation activities at those establishments primarily engaged in mining, developing mines, or exploring for metallic minerals (ores).

A stormwater permit generally is not appropriate for the following types of mines:

- Sites or parts of sites which are determined to cause or contribute to water quality standards violations
- Active facilities and those under reclamation, which have discharges subject to effluent limitation guidelines under NPDES, including other non-stormwater discharges such as from floor drains in maintenance buildings and preparation plant areas
- Pollutant seeps or underground drainage from inactive mines and refuse disposal areas that do not result from precipitation events.

For these types of sites, contact the EPA or state NPDES permitting authority to determine if and what type of discharge permit may be necessary.

What does an industrial stormwater permit require?

Common requirements for coverage under an industrial stormwater permit include development of a written stormwater pollution prevention plan (SWPPP), implementation of control measures, and submittal of a request for permit coverage, usually referred to as the Notice of Intent or NOI. The SWPPP is a written assessment of potential sources of pollutants in stormwater runoff and control measures that will be implemented at your facility to minimize the discharge of these pollutants in runoff from the site. These control measures include site-specific best management practices (BMPs), maintenance plans, inspections, employee training, and reporting. The procedures detailed in the SWPPP must be implemented by the facility and updated as necessary, with a copy of the SWPPP kept on-site. The industrial stormwater permit also requires collection of visual, analytical, and/or compliance monitoring data to determine the effectiveness of implemented BMPs. For more information on EPA's industrial stormwater permit and links to State stormwater permits, go to **www.epa.gov/npdes/stormwater** and click on "Industrial Activity."

What pollutants are associated with my facility's activities?

Pollutants conveyed in stormwater discharges from metal mining (ore mining and dressing) facilities will vary. There are a number of factors that influence to what extent industrial activities and significant materials can affect water quality.

- Geographic location
- Topography
- Hydrogeology
- Extent of impervious surfaces (e.g., concrete or asphalt)
- Type of ground cover (e.g., vegetation, crushed stone, or dirt)
- Outdoor activities (e.g., material storage, loading/unloading, vehicle maintenance)
- Size of the operation
- Type, duration, and intensity of precipitation events

Because of the land-disturbing nature of the ore mining and dressing industry, contaminants of concern generated by industrial activities include total suspended solids (TSS), total dissolved solids (TDS), turbidity, acid drainage, and heavy metals. Although there are many activities that occur at a facility, this fact sheet only covers those activities that occur outdoors and where activities or materials may be exposed to precipitation.

The activities, pollutant sources, and pollutants detailed in Table 1 are commonly found at metal mining (ore mining and dressing) facilities.

Table 1. Common Activities, Pollutant Sources, and Pollutants at Metal Mining (Ore Mining and Dressing) Facilities

Activity	Pollutant Source	Pollutant
Site preparation	Road construction	Dust, TSS, TDS, turbidity
	Removal of overburden	
	Removal of waste rock to expose the metal	
Mineral extraction	Blasting activities	Dust, TSS, nitrate/nitrite
Beneficiation activities	Milling	Dust, TSS, TDS, pH, turbidity, fines, heavy metals
	Flotation	Dust, TSS, TDS, pH, turbidity, fines, chemical reagents, acids, heavy metals
	Gravity concentration	TSS, TDS, pH, turbidity, heavy metals
	Amalgamation	Dust, TSS, TDS, pH, turbidity, heavy metals, mercury
	Waste rock storage	Dust, TSS, TDS, pH, turbidity, heavy metals
	Raw material loading	Dust, TSS, TDS, turbidity, heavy metals
	Process materials unloading	Diesel fuel, oil, gasoline, chemical reagents
	Raw waste material transportation	Dust, TSS, TDS, turbidity, heavy metals
Leaching	Heap leach piles	Dust, TSS, TDS, pH, turbidity, heavy metals, cyanide
Other activities	Sedimentation pond upsets	TSS, TDS, turbidity, pH, heavy metals
	Sedimentation pond sludge removal and disposal	Dust, TSS, TDS, turbidity, pH, heavy metals
	Air emission control device cleaning	Dust, TSS, TDS, turbidity, metals
Equipment/vehicle fueling and maintenance	Fueling activities	Gas/diesel fuel, oil
	Parts cleaning	Solvents, oil, heavy metals, acid/alkaline wastes
	Waste disposal of oily rags, oil and gas filters, batteries, coolants, and degreasers	Oil, heavy metals, solvents, acids
	Fluid replacement including hydraulic fluid, oil, transmission fluid, radiator fluids, and grease	Oil and grease, arsenic, lead, cadmium, chromium, chemical oxygen demand (COD), and benzene
Reclamation activities	Site preparation for stabilization	Dust, TSS, TDS, turbidity, heavy metals

Note: Activities may have additional pollutant sources that contain PFAS and can come into contact with stormwater discharges. Per and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that include PFOA, PFOS, GenX, and many other chemicals.

What BMPs can be used to minimize contact between stormwater and potential pollutants at my facility?

A variety of BMP options may be applicable to eliminate or minimize the presence of pollutants in stormwater discharges from metal mining facilities. You will likely need to implement a combination or suite of BMPs to address stormwater runoff at your facility. Your first consideration should be for pollution prevention BMPs, which are designed to prevent or minimize pollutants from entering stormwater runoff and/or reduce the volume of stormwater requiring management. Prevention BMPs can include regular cleanup, collection and containment of debris in storage areas, and other housekeeping practices, spill control, and employee training. It may also be necessary to implement treatment BMPs, which are engineered structures intended to treat stormwater runoff and/or mitigate the effects of increased stormwater runoff peak rate, volume, and velocity. Treatment BMPs are generally more expensive to install and maintain and include oil-water separators, wet ponds, and proprietary filter devices.

Sediment ponds, discharge diversion techniques, as well as methods of runoff dispersion, are control strategies often used to minimize impacts of significant materials on stormwater. For mine sites requiring additional sources of water for processing operations, rainfall events as well as stormwater run-on will be managed for use in dust suppression, processing, and washing activities. Many mine sites are already equipped with sedimentation ponds and other established process wastewater treatment methods in order to meet effluent limitation guidelines. Additional stormwater management practices used at metal mining facilities are described further in this fact sheet.

BMPs must be selected and implemented to address the following:

Good Housekeeping Practices

Good housekeeping is a practical, cost-effective way to maintain a clean and orderly facility to prevent potential pollution sources from coming into contact with stormwater. It includes establishing protocols to reduce the possibility of mishandling materials or equipment and training employees in good housekeeping techniques. Common areas where good housekeeping practices should be followed include trash containers and adjacent areas, material storage areas, vehicle and equipment maintenance areas, and loading docks. Good housekeeping practices must include a schedule for regular pickup and disposal of garbage and waste materials and routine inspections of drums, tanks, and containers for leaks and structural conditions. Practices also include containing and covering garbage, waste materials, and debris. Involving employees in routine monitoring of housekeeping practices has proven to be an effective means of ensuring the continued implementation of these measures. Industrial facilities can conduct activities that use, store, manufacture, transfer, and/or dispose of PFAS-containing materials. Successful good housekeeping practices to minimize PFAS exposure to stormwater could include inventorying the location, quantity, and method of storage; using properly designed storage and transfer techniques; providing secondary containment around chemical storage areas; and using proper techniques for cleaning or replacement of production systems or equipment.

Minimizing Exposure

Where feasible, minimizing exposure of potential pollutant sources to precipitation is an important control option. Minimizing exposure prevents pollutants, including debris, from coming into contact with precipitation and can reduce the need for BMPs to treat contaminated stormwater runoff. It can also prevent debris from being picked up by stormwater and carried into drains and surface waters. Examples of BMPs for exposure minimization include covering materials or activities with temporary structures (e.g., tarps) when wet weather is expected or moving materials or activities to existing or new permanent structures (e.g., buildings, silos, sheds). Even the simple practice of keeping a dumpster lid closed can be a very effective pollution prevention measure. Another example could include locating PFAS-containing materials and residues away from drainage pathways and surface waters.

Erosion and Sediment Control

BMPs must be selected and implemented to limit erosion on areas of your site that, due to topography, activities, soils, cover, materials, or other factors are likely to experience erosion. Erosion control BMPs such as seeding, mulching, and sodding prevent soil from becoming dislodged and should be considered first. Sediment control BMPs such as silt fences, sediment ponds, and stabilized entrances trap sediment after it has eroded. Sediment control BMPs should be used to back-up erosion control BMPs.

Because ore mining and dressing is largely a land disturbance activity, BMPs that minimize erosion and sedimentation will be most effective if installed at the inception of operations and maintained throughout active operations and reclamation of the site. From the construction of access and haul roads, to closure and reclamation activities, implementation of BMPs is often essential to minimizing long-term environmental impacts to an area.

A number of structural collection devices have been developed to remove sediment from runoff before it leaves the site. Several methods of removing sediment from site runoff involve diversion mechanisms previously discussed, supplemented by a trapping or storage device. Structural practices typically involve filtering diffuse stormwater flows through temporary structures such as straw bale dikes, silt fences, brush barriers, or vegetated areas.

Structural practices are typically low in cost yet require periodic removal of sediment to remain functional. As such, they may not be appropriate for permanent use at inactive mines. However, these practices may be effectively used as temporary measures during active operation and/or prior to the final implementation of permanent measures.

Management of Runoff

Your SWPPP must contain a narrative evaluation of the appropriateness of stormwater management practices that divert, infiltrate, reuse, or otherwise manage stormwater runoff so as to reduce the discharge of pollutants. Appropriate measures are highly site-specific, but may include, among others, vegetative swales, collection and reuse of stormwater, inlet controls, snow management, infiltration devices, and wet retention measures. Incorporating treatment like granular activated carbon may be helpful to remove certain pollutants like PFAS.

A combination of preventive and treatment BMPs will yield the most effective stormwater management for minimizing the offsite discharge of pollutants via stormwater runoff. Though not specifically outlined in this fact sheet, BMPs must also address preventive maintenance records or logbooks, regular facility inspections, spill prevention and response, and employee training.

All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements, others are quite involved. You must regularly inspect all BMPs to ensure they are operating properly, including during runoff events. As soon as a problem is found, action to resolve it should be initiated immediately.

BMPs for Metal Mining Facilities

EPA has identified a wide variety of best management practices (BMPs) that may be used to mitigate discharges of contaminants at mines. Many of the practices focus on sediment and erosion control and are similar to BMPs used in the construction industry. These controls to prevent erosion and control sedimentation are the most effective if they are installed at the inception of operations and maintained throughout active operations and reclamation of the site. For more details on the use and implementation of these practices you are encouraged to obtain a copy of one or more of the many good sediment and erosion control books available on the market. The following categories describe best management practice options for reducing pollutants in stormwater discharges at metal mining facilities.

- **Discharge Diversions.** Discharge diversions provide the first line of defense in preventing the contamination of discharges, and subsequent contamination of receiving waters. Discharge diversions are temporary or permanent structures installed to divert flow, store flow, or limit stormwater run-on and runoff.

  These diversion practices have several objectives. First, diversion structures can be designed to prevent otherwise uncontaminated (or less contaminated) water from crossing disturbed areas or areas containing significant amounts of contaminated materials, where contact may occur between run-on and site materials. These source reduction measures may be particularly effective for metal mining facilities because they prevent run-on of uncontaminated discharges from contacting exposed materials and/or reduce the flow across disturbed areas, thereby lessening the potential for erosion. Second, diversion structures can be used to collect or divert waters for later treatment, if necessary. The usefulness of these control measures are limited by such factors as the size of the area to be controlled and the type and nature of materials exposed and nature of precipitation events.

Diversion dikes, curbs, and berms are temporary or permanent diversion structures that prevent runoff from passing beyond a certain point, and divert runoff away from its intended path. Dikes, curbs or berms may be used to surround and isolate areas of concern, diverting flow around piles of overburden, waste rock, and storage areas, to minimize discharge contact with contaminated materials and to limit discharges of contaminated water from confined areas.

- **Drainage/Stormwater Conveyance Systems.** Drainage or stormwater conveyance systems can provide either a temporary or a permanent management practice which functions to channel water away from eroded or unstabilized areas, convey runoff without causing erosion, and/or carry discharges to more stabilized areas. The use of drainage systems as a permanent measure may be most appropriate in areas with extreme slopes, areas subject to high velocity runoff, and other areas where the establishment of substantial vegetation is infeasible or impractical.

  For instance, several BMPs may be useful stormwater and erosion control methods. Some examples of drainage/stormwater conveyance systems include:

  - *Channels or gutters*
  - *Open top box culverts and waterbars*
  - *Rolling dips and road sloping*
  - *Roadway surface water deflector*
  - *Culverts*

- **Runoff Dispersion.** Drainage systems are most effective when used in conjunction with runoff dispersion devises designed to slow the flow of water discharged from a site. These devices also aid stormwater infiltration into the soil and flow attenuation. Some examples of velocity dissipation devices include:

  - *Check dams*
  - *Rock outlet protection*
  - *Level spreaders*
  - *Serrated slopes and benched slopes*
  - *Contouring*
  - *Drop structures*

- **Sediment Control and Collection.** Erosion and sediment controls limit movement and retains sediments, preventing transportation offsite. Several structural collection devices have been developed to remove sediment from runoff before it leaves the site. Several methods of removing sediment from site runoff involve diversion mechanisms previously discussed, supplemented by a trapping or storage device. Structural practices typically involve filtering diffuse stormwater flows through temporary structures such as straw bale dikes, silt fences, brush barriers or vegetated areas.

  Structural practices are typically low in cost. However, structural practices require periodic removal of sediment to remain functional. As such, they may not be appropriate for permanent use at inactive mines. However, these practices may be effectively used as temporary measures along haul roads and access roads. Several examples of sediment control and collection BMPs include:

  - *Gabions, riprap, and native rock retaining walls*
  - *Biotechnical stabilization*
  - *Straw bale barrier*
  - *Vegetated buffer strips*
  - *Silt fence/filter fence*
  - *Siltation berms*
  - *Brush sediment barriers*
  - *Sediment traps or catch basins*
  - *Sediment/settling ponds*

- **Vegetation Practices.** Vegetation practices involve establishing a sustainable ground cover by permanent seeding, mulching, sodding, and other such practices. A vegetative cover reduces the potential for erosion of a site by: absorbing the kinetic energy of raindrops which would otherwise impact soil; intercepting water so it can infiltrate into the ground instead of running off and carrying contaminated discharges; and by slowing the velocity of runoff to promote on-site deposition of sediment. These practices include:
  - *Topsoiling*
  - *Broadcast seeding and drill seeding*
  - *Willow cutting establishment*
  - *Plastic matting, plastic netting and erosion control blankets*
  - *Mulch-straw or wood chips*
  - *Compaction*

  Typically, the costs of vegetative controls are low relative to other discharge mitigation practices. Given the limited capacity to accept large volumes of runoff, and potential erosion problems associated with large concentrated flows, vegetative controls should typically be used in combination with other management practices.
- **Capping.** Capping or sealing of waste materials is designed to prevent infiltration, as well as to limit contact between discharges and potential sources of contamination. Ultimately, capping should reduce or eliminate the contaminants in discharges. In addition, by reducing infiltration, the potential for seepage and leachate generation may also be lessened.

  In some cases, the elimination of a pollution source through capping contaminant sources may be the most cost effective control measure for discharges from inactive ore mining and dressing facilities. Depending on the type of management practices chosen the cost to eliminate the pollutant source may be very high. Once completed, however, maintenance costs will range from low to nonexistent.
- **Treatment.** In some cases (e.g., low pH and/or high metals concentrations), BMPs, and sediment and erosion controls may not be adequate to produce an acceptable quality of stormwater discharge. Under those circumstances additional physical or chemical treatment systems may be necessary to protect the receiving waters. Treatment practices are those methods of control which normally are thought of as being applied at the "end of the pipe" to reduce the concentration of pollutants in stormwater before it is discharged. This is in contrast to many BMPs, where the emphasis is on keeping the water from becoming contaminated. Treatment practices may be required where flows are currently being affected by exposed materials and other BMPs are insufficient to meet discharge goals. These practices are usually the most resource intensive as they often require significant construction costs and monitoring and maintenance on a frequent and regular basis.

  Treatment options may involve a range of maintenance controls. High maintenance treatment techniques require manpower to operate and maintain the BMP. Low maintenance cost techniques have initial capital costs but operate with low long-term maintenance after being implemented. At a few sites, treatment measures other than high maintenance measures may be appropriate to address specific pollutants. Several examples of treatment BMPs include chemical or physical treatment, oil/water separators, and artificial wetlands.

  An example of a high maintenance technology that is found at many active metal mining facilities is chemical/physical treatment. The most common type of chemical/physical treatment involves the addition of lime or other such caustics to remove metals. Metals may be removed from stormwater by raising the pH of the stormwater to precipitate them out as hydroxides. After metals precipitation, the addition of some form of acid or carbon dioxide may be required to reduce the pH to acceptable levels. Polymer addition may be required to enhance the settling characteristics of the metal hydroxide precipitate. In general, this practice requires significant operator participation to ensure proper neutralization and/or precipitation and thus may not be cost effective for most stormwater discharges.

Another example of a high maintenance treatment technology is an oil/water separator. An American Petroleum Institute (API) oil/water separator or similar type of treatment device skims oil and settles sludge to remove oil from water. This type of BMP system can be effective for improving water quality either alone or in conjunction with other treatment practices.

The use of artificial wetlands is another method of treating process wastewater from inactive mines. There has been extensive research on the use of artificial wetlands as a means of mitigating acid mine drainage. They can be an effective system for improving water quality either alone or in conjunction with other treatment practices. The complex hydrologic, biological, physical, and chemical interactions that take place within a wetland result in a natural reduction and cleansing of influent pollutants. Wetland processes are able to filter sediments and absorb and retain chemical and heavy metal pollutant through biological degradation, transformation, and plant uptake.

Artificial wetlands are designed to maintain a permanent pool of water. Properly installed and maintained retention structures (also known as wet ponds) and artificial wetlands will be most cost-effective when used to control runoff from larger, intensively developed sites. These artificial wetlands are created to provide treatment but also provide a wildlife habitat, and may enhance recreation and landscape amenities.

BMPs for Site Activities

A number of sites and activities found at metal mining facilities require the implementation of BMPs to prevent the contamination of stormwater. Implementation of BMPs are required not only for mineral extraction sites and material piles, but for discharges from roads accessing these sites. Additionally, restabilization must occur with any disturbed areas. An overview of additional BMPs that may be applicable at haul or access roads; pits or quarries; overburden, waste rock, and raw material piles; and reclamation activities are discussed below.

- **Haul Roads and/or Access Roads.** Placement of haul roads or access roads should occur as far as possible from natural drainage areas, lakes, ponds, wetlands, or floodplains where soil will naturally be less stable for heavy vehicle traffic. If a haul road must be constructed near water, as little vegetation as possible should be removed from between the road and the waterway, as vegetation is a useful buffer against erosion and is an efficient sediment collection mechanism. The width and grade of haul or access roads should be minimal and designed to match natural contours of the area. Construction of haul roads should be supplemented by BMPs that divert runoff from road surfaces, minimize erosion, and direct flow to appropriate channels for discharge to treatment areas or other well-stabilized areas.
- **Equipment/Vehicle Fueling and Maintenance.** Fueling and maintenance activities should be conducted indoors or under cover on an impermeable surface. Berms, curbs, or similar means should be used to ensure that stormwater runoff from other parts of the facility does not flow over maintenance and fueling areas. Runoff from fueling and maintenance areas should be collected and treated or recycled. Proper waste management and spill prevention and response procedures should be implemented. Select good housekeeping procedures to minimize the amount of contaminated runoff generated (e.g. use dry cleanup methods, use drip pans, and drain parts of fluids before disposal). Conduct inspections of fueling areas to prevent problems before they occur.
- **Pits or Quarries.** Excavation of a pit or quarry must be accompanied by BMPs to minimize impacts to area surface waters. As little vegetation as possible should be removed from these areas during excavation activities to minimize exposed soils. In addition, stream channels and other sources of water that may discharge into a pit or quarry should be diverted around that area to prevent contamination.

  BMPs can be used to control total suspended solids levels in runoff from unvegetated areas. These can include sediment/settling ponds, check dams, silt fences, and straw bale barriers.

- **Overburden, Waste Rock, and Raw Material Piles.** Overburden, topsoil, and waste rock, as well as raw material and intermediate and final product stockpiles, should be located away from surface waters, other sources of water and from geologically unstable areas. In addition surface waters and stormwater should be diverted around the piles. As many piles as possible should be revegetated, (even if only on a temporary basis). At closure, remaining piles should be reclaimed.

  Reclamation Activities. When a mineral deposit is depleted and operations cease, a mine site must be reclaimed according to appropriate state or federal standards. Closure activities typically include restabilization of disturbed areas such as access or haul roads, pits or quarries, sedimentation ponds or work-out pits, and remaining waste piles. Overburden and topsoil stockpiles may be used to fill in a pit or quarry (where practical). Recontouring and revegetation should be performed to stabilize soils and prevent erosion.

  Major reclamation activities such as recontouring roads and filling in a pit or quarry can only be performed after operations have ceased. However, reclamation activities such as stabilization of banks, reseeding, and revegetation should be implemented in mined out portions, or inactive areas of a site as active mining moves to new areas.

EPA recognizes that quarries are frequently converted into reservoirs, or recreational areas, after the mineral deposit is depleted. However, this does not preclude the reclamation of disturbed areas above the quarry rim.

Typically, the costs of stabilization controls are low relative to other discharge mitigation practices. Given the limited capacity to accept large volumes of runoff, and potential erosion problems associated with large concentrated flows, stabilization controls should typically be used in combination with other management practices. These measures have been documented as particularly appropriate for mining sites.

BMPs for Various Extraction Techniques

Metals are recovered by three basic extraction techniques: surface mining; underground mining; and placer mining. Each type of extraction method may be followed by varying methods of beneficiation and processing. Due to similarities in mining operations for many of the minerals within this industry, activities, significant materials, and materials management practices are fairly uniform.

- **Surface mines.** Materials management practices at surface mines are typically designed to control dust emissions and soil erosion from extraction activities, and offsite transport of significant materials. Settling ponds and impoundments are commonly used to reduce TSS and other contaminants in process generated wastewaters. These controls may also be used to manage stormwater runoff and run-on with potentially few alterations to on-site drainage systems.

  Impoundments are used to manage tailings generated at facilities engaged in flotation or heavy media separation operations. These impoundments are used to manage beneficiation/ processing wastewaters generated at the facility and may also be used to manage stormwater runoff.
- **Underground mines.** Materials management practices for significant materials at the surface of underground mining facilities are similar to those materials management practices used at surface mining operations. However, waste rock or mill tailings are in some cases being returned to the mine as fill for the mined-out areas or may be directed to a disposal basin.
- **Placer mines.** Settling ponds are used to manage process wastewaters and are, in some cases, being used to manage contaminated stormwater runoff.
- **Inactive mines.** Inactive mine sites also require implementation of BMPs. Inactive ore mining and dressing operations are those where industrial activities are no longer occurring. When active, mineral extraction could have occurred from surface mines, solution mines, placer operations, or underground mines. These sites require permit coverage until reclaimed because

significant materials may remain on-site, and, if exposed, are potential sources of stormwater contamination. Due to the seasonal nature of this industry, mine sites can become temporarily inactive for extended periods of time. Temporarily inactive sites are not viewed the same as permanently inactive sites.

Implement BMPs, such as those listed below in Table 2 for the control of pollutants at metal mining facilities, to minimize and prevent the discharge of pollutants in stormwater. Identifying weaknesses in current facility practices will aid the permittee in determining appropriate BMPs that will achieve a reduction in pollutant loadings. BMPs listed in Table 2 are broadly applicable to metal mining facilities; however, this is not a complete list and you are recommended to consult with regulatory agencies or a stormwater engineer/consultant to identify appropriate BMPs for your facility.

Table 2. BMPs for Potential Pollutant Sources at Metal Mining (Ore Mining and Dressing) Facilities

Pollutant Source	BMPs
Haul Roads and/or Access Roads	❑ Construction of haul roads should be supplemented by BMPs that divert runoff from road surfaces, minimize erosion, and direct flow to appropriate channels for discharge to treatment areas. Examples of BMPs include: - Install dikes, curbs, and berms for discharge diversions. - Install conveyance systems such as channels, gutters, culverts, rolling dips and road sloping, and/or roadway water deflectors. - Use check dams, rock outlet protection, level spreaders, stream alternation and drop structures for runoff dispersion. - Install gabions, riprap, native rock retaining walls, straw bale barriers, sediment traps/catch basins, and vegetated buffer strips for sediment control and collection. - Keep as much vegetation as possible when building roads and seed as necessary. Stabilize soil via willow cutting establishment. ❑ Place as far as possible from natural drainage areas, lakes, ponds, wetlands, or floodplains ❑ Width and grade of roads should be as small as possible to meet regulatory requirements and designed to match the natural contours of the area. ❑ Frequently inspect all stabilization and structural erosion control measures and perform all necessary maintenance and repairs.
Pits/Quarries or Underground Mines	❑ Install dikes, curbs, and berms for discharge diversions. ❑ Install conveyance systems such as channels and gutters to control runoff and run-on. ❑ Use serrated slopes, benched slopes, contouring, and stream alteration to direct uncontaminated discharges away from a pit or quarry. ❑ Install sediment settling ponds, straw bale barrier, and siltation berms. ❑ Keep as much vegetation as possible when excavating and seed as necessary to minimize the amount of exposed soils.
Overburden, Waste Rock, and Raw Material Piles	❑ Overburden, topsoil, waste rock, raw material, or intermediate and final product stockpiles should be located away from surface waters and other sources of run-on, as well as geologically unstable areas. ❑ Install dikes, curbs, and berms for discharge diversions to control runoff and run-on. ❑ Install conveyance systems such as channels and gutters to control runoff and run-on. ❑ Use serrated slopes, benched slopes, contouring, and stream alteration around piles for sediment control and runoff dispersion. ❑ Install plastic matting, plastic netting, erosion control blankets, mulch straw, sediment/settling ponds, silt fences, siltation berms, and/or compaction for sediment control and collection. ❑ Stabilize and recontour piles as necessary.

Table 2. BMPs for Potential Pollutant Sources at Metal Mining (Ore Mining and Dressing) Facilities (continued)

Pollutant Source	BMPs
Reclamation	❑ Vegetate as many piles as possible (involves topsoiling, seedbed preparation, and/or seeding). ❑ Install dikes, curbs, and berms for discharge diversions. ❑ Install conveyance systems such as channels and gutters. ❑ Use check dams, rock outlet protection, level spreaders, stream alternation, drop structures, serrated slopes, drain fields, benched slopes, contouring, and stream alteration for runoff dispersion. ❑ Install gabions, riprap, native rock retaining walls, straw bale barriers, sediment traps/catch basins, biotechnical stabilization, silt fences, siltation berms, brush sediment barriers, and vegetated buffer strips for sediment control and collection. ❑ Recontouring and vegetation should be performed to stabilize soils and prevent erosion in mined out portions or inactive areas of the site as active mining moves to new areas (includes topsoiling, seedbed preparation, seeding, and willow cutting establishment). ❑ If a quarry is being converted into a reservoir or recreational area, disturbed areas above the quarry rim must still be reclaimed. ❑ Use overburden and topsoil stockpiles to fill in a pit or quarry (when practical).
Equipment/vehicle maintenance	Minimizing Exposure ❑ Perform all cleaning operations indoors or under covering when possible. Conduct the cleaning operations in an area with a concrete floor with no floor drainage other than to sanitary sewers or treatment facilities. ❑ If operations are uncovered, perform them on a concrete pad that is impervious and contained. ❑ Park vehicles and equipment indoors or under a roof whenever possible and maintain proper control of oil leaks/spills. ❑ Check vehicles closely for leaks and use pans to collect fluid when leaks occur. Management of Runoff ❑ Use berms, curbs, or other diversion measures to ensure that stormwater runoff from other parts of the facility do not flow over the maintenance area. ❑ Collect the stormwater runoff from the cleaning area and provide treatment or recycling. Discharge vehicle wash or rinse water to the sanitary sewer (if available and allowed by sewer authority), wastewater treatment, a land application site, or recycle on-site. DO NOT discharge washwater to a storm drain or to surface water. Inspections and Training ❑ Inspect the maintenance area regularly for proper implementation of control measures. ❑ Train employees on proper waste control and disposal procedures. Good Housekeeping ❑ Eliminate floor drains that are connected to the storm or sanitary sewer; if necessary, install a sump that is pumped regularly. Collected wastes should be properly treated or disposed of by a licensed waste hauler. ❑ Use drip pans, drain boards, and drying racks to direct drips back into a fluid holding tank for reuse. ❑ Drain all parts of fluids prior to disposal. Oil filters can be crushed and recycled. ❑ Promptly transfer used fluids to the proper container; do not leave full drip pans or other open containers around the shop. Empty and clean drip pans and containers. ❑ Dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers properly. ❑ Store batteries and other significant materials inside.

Table 2. BMPs for Potential Pollutant Sources at Metal Mining (Ore Mining and Dressing) Facilities (continued)

Pollutant Source	BMPs
Equipment/vehicle maintenance (continued)	Good Housekeeping (continued) ❑ Label and track the recycling of waste material (e.g., used oil, spent solvents, batteries). ❑ Maintain an organized inventory of materials. ❑ Eliminate or reduce the number and amount of hazardous materials and waste by substituting nonhazardous or less hazardous materials. ❑ Clean up leaks, drips, and other spills without using large amounts of water. Use absorbents for dry cleanup whenever possible. ❑ Prohibit the practice of hosing down an area where the practice would result in the discharge of pollutants to a stormwater system. ❑ Clean without using liquid cleaners whenever possible. ❑ Do all cleaning at a centralized station so the solvents stay in one area. ❑ If parts are dipped in liquid, remove them slowly to avoid spills. ❑ Do not pour liquid waste into floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
Fueling activities	❑ Conduct fueling operations (including the transfer of fuel from tank trucks) on an impervious or contained pad or under a roof or canopy where possible. Covering should extend beyond spill containment pad to prevent rain from entering. ❑ When fueling in uncovered area, use a concrete pad (asphalt is not chemically resistant to the fuels being handled). ❑ Use drip pans where leaks or spills of fuel can occur and where making and breaking hose connections. ❑ Use fueling hoses with check valves to prevent hose drainage after filling. ❑ Use spill and overflow protection devices. ❑ Keep spill cleanup material readily available. Clean up spills and leaks immediately. ❑ Minimize/eliminate run-on into fueling areas with diversion dikes, berms, curbing, surface grading or other equivalent measures. ❑ Collect stormwater runoff and provide treatment or recycling. ❑ Use dry cleanup methods for fuel area rather than hosing down the fuel area. Follow procedures for sweeping up absorbents as soon as spilled substances have been absorbed. ❑ Perform inspection and preventive maintenance on fuel storage tanks to detect potential leaks before they occur. ❑ Inspect the fueling area to detect problems before they occur. ❑ Train personnel on fueling procedures in the SWPPP. ❑ Provide curbing or posts around fuel pumps to prevent collisions from vehicles. ❑ Discourage "topping off" of fuel tanks.

What if activities and materials at my facility are not exposed to precipitation?

The industrial stormwater program requires permit coverage for a number of specified types of industrial activities. However, when a facility is able to prevent the exposure of ALL relevant activities and materials to precipitation, it may be eligible to claim no exposure and qualify for a waiver from permit coverage.

If you are regulated under the industrial permitting program, you must either obtain permit coverage or submit a no exposure certification form, if available. Check with your permitting authority for additional information as not every permitting authority program provides no exposure exemptions.

Where do I get more information?

For additional information on the industrial stormwater program see **www.epa.gov/npdes/stormwater/msgp**.

A list of names and telephone numbers for each EPA Region or state NPDES permitting authority can be found at **www.epa.gov/npdes/stormwatercontacts**.

References

Information contained in this Fact Sheet was compiled from EPA's past and current Multi-Sector General Permits and from the following sources:

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