Closing A Mine

At some point in the life of a mine, the ore resources will be mined out and the operator can no longer process material without incurring financial loss. It's time to close. The mining company may decide to stop active mining but continue process stockpiled ore or to continue leaching the ore on a leach pad. Many operators will continue leaching for several years following cessation of actual mining. There is no regulatory requirement prohibiting this post-mining activity, provided that the leach pad and other active components are still functional and not leaking. However, the Nevada mining regulations do state that a facility must go into permanent closure if the end of design life for a mining component has been reached. For example, a tailings impoundment is full and no volume remains; this facility must be closed (or undergo a permit modification to build additional capacity). Another example of end of design life would be a leach pad that is leaking, causing groundwater degradation, and the leak is buried under ore and cannot be repaired; this leach pad must be closed.

Also per State regulation, the entire mine facility (or an individual component thereof) must be closed if it has been in a special type of temporary closure (unplanned temporary closure) for no longer than the end of one renewal of a 5-year Water Pollution Control Permit (WPCP). In other words, if the mine is in unplanned temporary closure for four years and is not expected to reopen by the time the Permit is renewed, it must go into permanent closure. The operator must submit a Final Plan for Permanent Closure (FPPC) and a closure permit will be issued instead of a renewed operation Permit.

Closing a mine requires a "Final Plan for Permanent Closure"

Closure of a mine does not mean everyone walks away. While the miners may stop mining, the work does not end. Upon closure, operators of mine sites that have heap leach pads, tailings impoundments, waste rock dumps, and/or other components that contain potential pollutants will have to keep an eye on these facilities to ensure that they are chemically stabilized and will not degrade waters of the State. Nevada Administrative Code requires pits, leach pads, and tailings impoundments, to be chemically stabilized following closure. All other potential sources of pollutants at a mine site also have to be chemically stabilized, removed, or mitigated. Stabilization means the pits must be free-draining and not impounding water; leach pads and tailings impoundments must not leak or release contaminants to the environment. A Final Plan for Permanent Closure (FPPC) must be submitted to BMRR and a Closure Permit will be issued based upon the FPPC. Closure activities must follow an approved FPPC. After all the approved closure activities are completed, the operator must monitor the facility for up to 30 years to ensure that the closure was effective and additional action is unnecessary; if the Division agrees, then the facility is considered closed, the Closure Permit is terminated, and no further action is required from the operator.

How process facilities are closed

Exact closure methods are not specified in regulation, but the following summary describes the most common methods approved by the Division. What is required is that all potential sources of pollutants be removed, mitigated, or chemically stabilized, as reviewed and approved by the

Division. Heap leach pads are usually re-sloped, and a two-to-four-foot soil cover is usually installed and seeded with a mix of native Nevada plants appropriate for that elevation. The cover

causes most of the water that falls as rain or snow to run off the top of the leach pad and not infiltrate. The vegetative cover will also intercept water that seeps down to the root zone, further reducing infiltration to the underlying spent ore. If a leach pad has a leak, the Division may require a geosynthetic liner cap over the spent ore and then a soil cover over that to completely eliminate any infiltration and prevent further leakage. A closed leach pad with a well-designed and established cover may have little or no water reporting to an evaporation cell (E-cell) or an evaporation/transpiration (ET) cell, depending on other site-specific factors, such as the annual precipitation amount and how much of the precipitation falls as snow. See Figure 6.

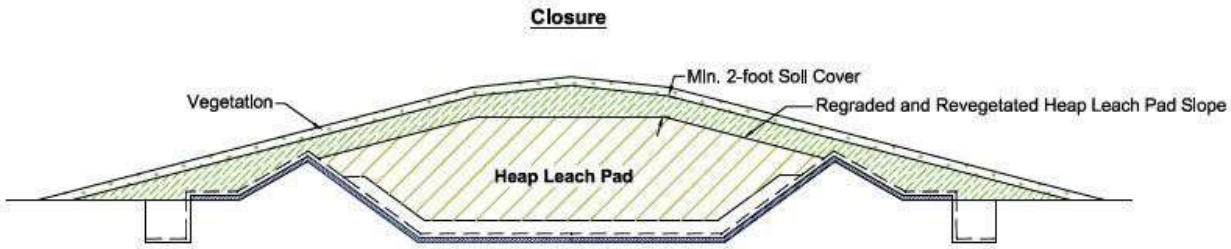

Figure 6: An idealized closed heap leach pad with an engineered cover in place.

Most facilities will convert one or more of the process ponds into an E-cell, or ET-cell, or a treatment cell. The E-cell is filled with coarse material for storing the water with no vegetative cover to store and evaporate the heap leach or tailings draindown. The ET-cell uses coarse material for storage and evaporation, but also includes a vegetation cover to allow plants to uptake excess water collecting in the basin. A treatment cell might have lime or organic material in it to passively treat low pH draindown from a heap leach pad. All of these types of cells retain the double liners and leak detection systems that were present when they were operating process ponds. The operator is required to monitor the leak detection system regularly. Many E-cells will revegetate on their own over time. As time passes, the draindown rate from the closed facilities may trickle to near zero, flowing into the lined cell only rarely. See Figure 7.

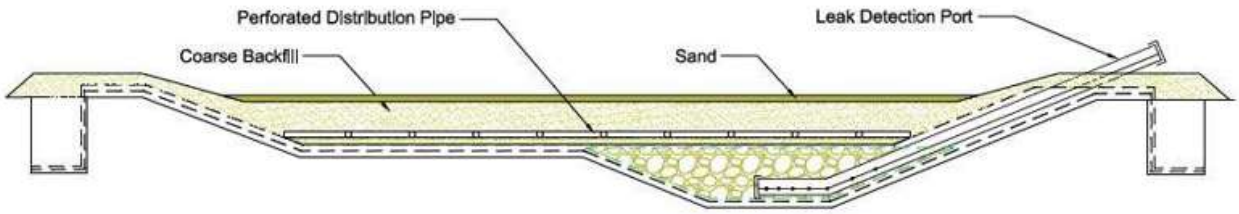

Figure 7: An idealized evaporation cell converted from a process pond used to contain draindown from a leach pad or tailings impoundment. There is no open pool or pond on these structures; all water is contained below the surface within the coarse backfill.

Tailings impoundments are closed in a similar fashion. They are dried out and covered with clean material, perhaps from a waste rock dump, and sloped to encourage runoff of rain and snow. Then they are covered with an approved thickness of soil to support vegetation and seeded. The Division requires that closure covers and stormwater diversions be designed to withstand a 500-year, 24-hour storm event (approximately 3.5 to 4 inches of rain in one 24-hour period in most parts of Nevada), and after conversion to E-, ET-, or treatment cells. Additionally, ponds must have the capacity to contain the 500-year, 24-hour storm event in addition to the normal draindown flow. See Figure 8.

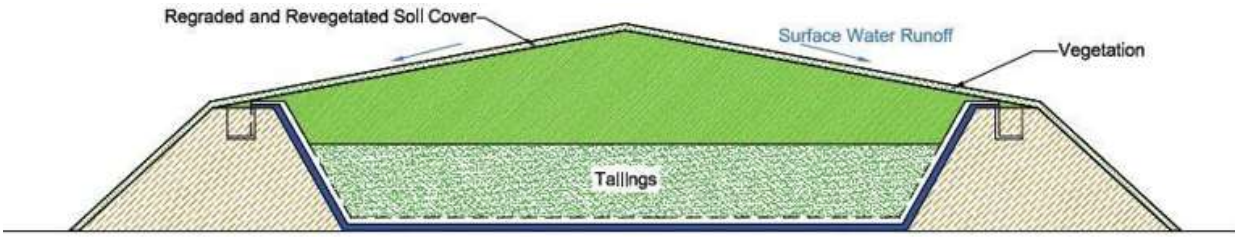

Figure 8: An idealized closed tailings impoundment with an engineered cover in place.

When a mine is considered fully "Closed" and the Permit can be terminated

A mine cannot have its WPCP terminated until all potential sources of pollutants have been removed, mitigated, or chemically stabilized. Additionally, there can be no groundwater or surface water impacts, and the chemical stabilization has been confirmed during a post-closure monitoring period of up to 30 years long. If during the post-closure monitoring period it is discovered that chemical stabilization has not been achieved, the Division will require additional permanent closure actions, after which a new post-closure monitoring period of up to 30 years will commence. A site that is ready for Permit termination will typically have a vegetated soil cover on any leach pads with low draindown flows reporting to an E-cell or ET-cell; a tailings impoundment will typically have a vegetated soil cover and low draindown flows reporting to the associated E- cell or ET-cell; any pit lakes will be chemically stable with water quality that will not adversely affect humans, or terrestrial and avian wildlife, and there is clean water in the monitoring wells. Additionally, the waste rock facilities cannot have low pH water seeping from the toe of the dumps. In summary, if all former process components and other pollutant sources have been confirmed to be chemically stable during the post-closure monitoring period, then the WPCP can be terminated.