



Information Regarding Heap Leach Pads

Modern heap leach pads are large, engineered structures, lined with an impermeable layer of plastic (referred to as a geosynthetic membrane) and placed over a prepared surface that is typically a compacted soil layer. Ore is placed (heaped) on the lined pad and treated with chemicals to dissolve (leach) metals of interest while protecting the environment. The plastic liner placed at the bottom and around the sides of the pad prevents chemicals from leaking into the soil and contaminating groundwater.

The plastic utilized for these liners must be capable of withstanding the excessive weight of stacked ore, the continuous application of corrosive chemicals, and harsh weather conditions over the long term. The two most common plastics used for liners are high-density polyethylene (HDPE) or linear low-density polyethylene (LLDPE), with a thickness of between 60 and 80-mils. For comparison, a typical heavy-duty garbage bag used at home is about 3-mil thick. Liners specifically intended to prohibit the release of chemicals or hazardous substances into the environment must meet standardized and internationally recognized installation and testing protocols to ensure there are no gaps, holes, or areas of potential failure. Since a heap leach pad is a process component, like all process components at a mine site, a heap leach pad cannot be put into service or operational use until the Nevada Division of Environmental has reviewed and approved a detailed Record of Construction (also known as an “as-built” report), prepared by a Nevada-licensed and registered professional engineer, showing that the pad was constructed properly and has been tested to ensure that it will not leak to the environment during and after active operations.

Both run-of-mine (uncrushed) and crushed ores are often placed on a heap leach pad. The leach solution, which typically consists of water and either dilute sodium cyanide or sulfuric acid (depending on which metals are being recovered), is dripped onto the top of the pad, much like a garden drip system, where it dissolves metals in the ore and seeps down to the liner. This “pregnant” water (also known as “preg” solution) then flows horizontally to a collection point. The preg solution is collected in pipes or lined channels and directed to a double-lined storage pond equipped with a leak detection system, also called a “leak collection and recovery system” (LCRS).

The LCRS is required for all process components such as heap leach pads and process ponds to ensure primary liners or containment systems are not leaking contaminants into groundwater. See the discussion on process ponds for more information.

The pond that collects the leach solution is called a “preg pond.” The solution in the preg pond is then pumped to the mill building where process techniques are used to recover the metals. Once the metals are removed from the preg solution, the resulting water is called “barren” solution. The barren solution is replenished with cyanide or acid and is stored in a double-lined, leak-detected barren pond before being pumped back up to the top of the leach pad to renew the process.

Leach pads are required to have leak detection systems and downgradient monitoring wells to ensure no process solution is leaking into groundwater.

See Figures 1 and 2 below.

Heap Leach Pad Facility Plan View

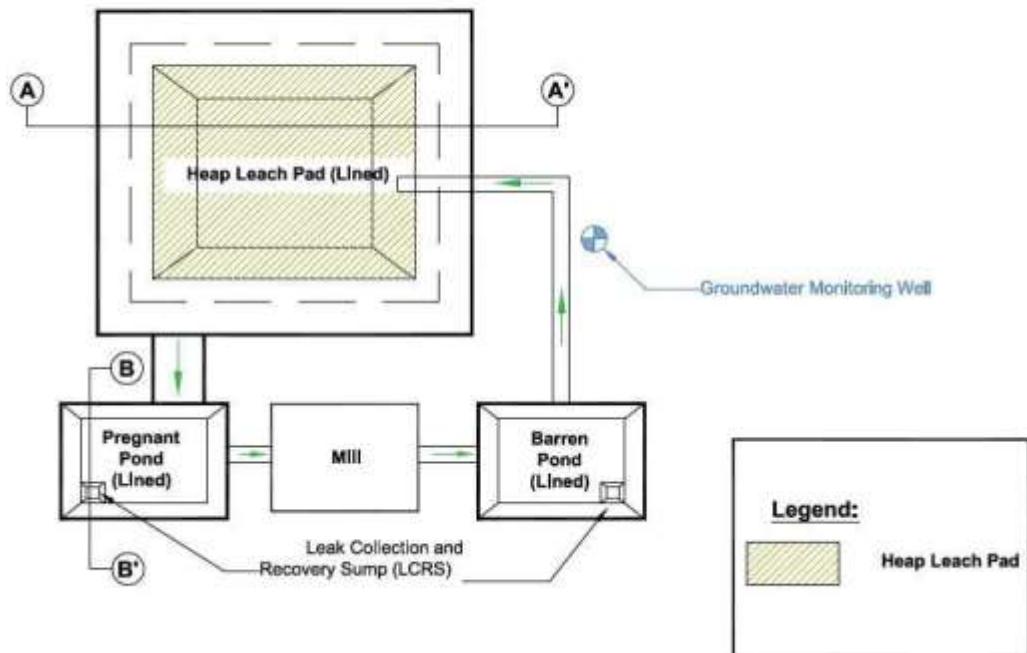


Figure 1: Top view of an idealized heap leach pad with associated process ponds. Green arrows show direction of solution flow.

Section A-A': Heap Leach Pad Cross-section

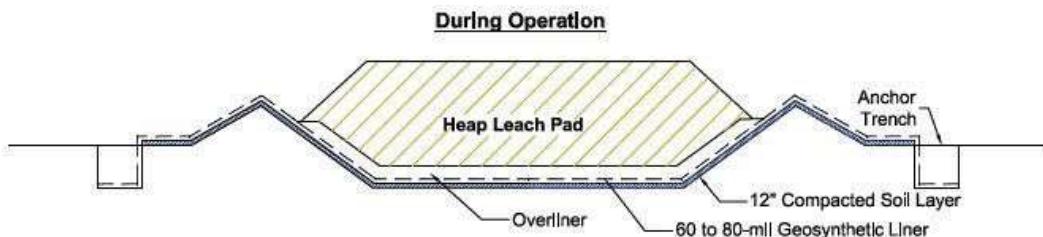


Figure 2: Side view of an idealized heap leach pad showing the liner system at the bottom. Current design criteria require the installation of a LCRS system to detect leakage from the heap leach pad's primary liner as well as a network of monitoring wells.