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FIGURES

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Attachment OP-2
Summary of Engineering Controls

Note: This material is also part of the NRC NUREG-1910, "Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities", 2009 (GEIS). Engineering controls are discussed in general in Section 7.4 of the GEIS, and cross-references to specific GEIS sections are also included. Cross-references to specific sections of the WDEQ-LQD Operations Plan are also included.

1.0 Mine Unit

Each mine unit consists of a monitor well ring, production patterns, and the associated infrastructure to allow for transfer of lixiviant to and from the Plant. The mine unit boundaries are based on the geometry of the specific uranium mineralization and will have sufficient size and lateral continuity to enable economic uranium extraction. The well pattern installation for a given mine unit is based on the subsurface geometry of the ore deposit. Various pattern shapes are used including five-spot, line drives and various alternate configurations. Because roll-front uranium deposits normally have irregular shapes, some of the well patterns in a given well field are also irregular, and the well patterns may be altered to fit the size, shape, and boundaries of individual ore bodies. Depending on ore body geometry and surface topography, a typical pattern will be from 6,000 to 10,000 sq. ft. Ore body size and geometry will also influence the number of wells in a mine unit.

1.1 Pipelines

Pipelines are used to transport lixiviant to and from the Plant, the mine units, the header houses and eventually the injection and production wells. Pipelines are also used to transport waste water to the disposal wells. The lines are generally buried, minimizing the possibility of freezing in adverse weather and of being damaged by surface traffic (Section OP 2.9.1). In general, piping to and from the Plant and the mine units and within the mine units are constructed of high density polyethylene (HDPE) with butt-welded joints or the equivalent. In addition to the electronic engineering controls described below, Plant and Mine Unit operators augment the systems by performing routine visual checks and comparisons of the operating parameters. Access routes are installed (where possible) to track pipelines and powerlines to allow operators to perform visual inspections during travel.

1.1.1 Flow

Flow is measured at entrance and exit points of the Plant and the header houses. Flow data from the header house is transmitted to the Plant and compared to the Plant outflow through the Plant Programmable Logic Controller (PLC) to determine if a leak is present. If the change in flow is beyond the set point (allowing for accuracy in the measurement devices), then an alarm occurs.

1.1.2 Pressure

Pressure is measured at entrance and exit points of the Plant and the header houses. Pressure data from the header house headers is transmitted to the Plant and compared to the Plant outflow through the Plant PLC to determine if a leak is present. If the change in pressure is beyond the set point (allowing for friction and elevation), then an alarm occurs.

1.1.3 Leak Detection

As previously indicated in Sections 1.1.1 and 1.1.2 above, leak detection occurs in the form of pressure and flow measurement and comparison. If changes occur in the measured variables, then an alarm occurs. Additionally, more conventional methods of leak detection occur continually during production operations. Standard operating procedures (SOPs) require routine inspection of pipeline ROWs and valve station inspections. Operators are trained to look for leak indicators in their visual inspections of pattern areas, header houses and pipeline (ROWs).

1.2 Monitor Wells

There are three types of wells required: injection wells for injecting lixiviant; production wells for uranium production; and monitoring wells for assessing ongoing operations. In addition, observation wells may be used to supplement information from monitor wells where additional data is preferred. (Deep disposal wells are discussed in Section 2.5.3 of this attachment).

1.2.1 Installation

Design, location and installation are based on data gathered during exploration and delineation drilling. That previous drilling allows for the geologists to correlate the sands and confining units associated with the mine unit. The geologist also generally defines the ore completion horizons and their relationship to the monitor well ring. From this combined information, the geologist specifies the locations of the exterior, overlying, underlying and production zone monitor wells including their proposed completion intervals. This same information may be used to recommend the installation of observation wells to supplement monitoring. This may be particularly helpful in areas where the standard monitor wells are an abnormal distance from the zone of interest or where the standard may not be at the appropriate level for the existing hydrologic conditions.

The monitor and/or observation well locations are surveyed, drill locations are constructed and pilot holes are drilled and a geophysical log of the hole is made. The geologist checks the actual geophysical log versus the estimate and revises the casing and completion interval accordingly. The well casing is then installed, cemented in place and the cement allowed to cure. The well is then completed by under-reaming the desired monitor interval and possibly installing a well screen, if necessary. The final step for the drilling rig is to develop the completion interval by "airlifting" the well. After the rig moves off the location, a mechanical integrity test (MIT) is performed on the well. Following the MIT, a swabbing unit is typically used to develop the well again to insure an adequate completion. The final step is the installation of a pump, water level measurement, and sampling for water quality.

1.2.2 Water Quality (OP 3.6.4.1)

The water quality data provides the baseline assessment for the monitor well ring as well as the excursion detection procedure. Baseline water quality in the monitor ring is determined from four sampling events prior to production operations. Subsequent operational sampling is compared to the upper control limits (UCLs) for chloride, conductivity and total alkalinity. The same procedure will typically be used to evaluate baseline conditions in any observation wells installed, although multiple rounds of sampling and analysis may not occur to determine baseline. As the monitor and/or observation well samples are collected, they are evaluated in the on-site laboratory for the excursion parameters. The analytical results are put in the monitor well database and compared against previous results and the UCLs for significant changes or trends. This analysis indicates whether the mine unit is operating as planned or whether an excursion or a trend toward an excursion is occurring. Section OP 3.6.4.3 details the measures in excursion detection and verification.

Any adverse trend in water quality is reported to the site Operations Manager who will work with his staff to reverse the affects. Methods for trend reversal include modifying pattern balance in the region and increasing localized bleed (OP 3.6.4.4). Also included in this process is the review of well completion records, area geology and well history to insure no issues exist with any of the well placements or completions.

1.2.3 Water Levels

Sudden changes in water levels may indicate that the mine unit flow is out of balance. Increases in water levels in the overlying or underlying aquifers may be an indication of fluid migration from the production zone. Flow rates would be adjusted to correct this situation (**OP 3.6.4.2 through 4**). Adjustments to well flow rates or complete shutdown of individual wells may be required to correct this situation. Increases in water levels in the overlying or underlying aquifers may also be an indication of casing failure in a production, injection or monitor well. Isolation and shutdown of individual wells can be used to determine the well causing the water level increases. **Figure OP A2-5** provides the typical monitor well data review process in flowchart form.

Baseline water levels in the monitor ring are determined during four sampling events prior to production operations. Subsequent operational sampling water levels are put in the monitor well database and compared against previous results and the baseline data for significant changes or trends. This trend analysis may indicate an unbalanced group of patterns and may be the precursor to an increase in water quality parameters. Analysis may be in the form of numerical, graphical or both. **Figure OP-A2-1** depicts one form of this review method. In this example, a significant change is highlighted after the May 15 sample. However, this method does not provide the entire water balance picture.

In the case of ring monitor wells, an additional review method that will be used in conjunction with the individual water levels is a "rose" or "radar" plot. The "Rose Diagram" provides a quick, visual method to identify these changes over time and aids the reviewer in recognizing anomalous regional trends. Changes will trigger a review of operational activities within the area of interest and a possible modification of operating flow rates and pattern balance. The water level data for all the monitor wells of the same horizon are plotted radially and anomalies are graphically noted. In the rudimentary example shown in **Figure OP A2-2**, it is easily seen that a "mounding" of water is occurring at M-101. The plot during actual operations would include all the wells in the entire monitor ring, typically.

In the case of overlying and underlying monitor wells, the water level data will be plotted on a standard line graph along with the baseline water level. Any increase in the water level above baseline or an increase in water level of greater than ten feet will result in an immediate investigation to determine the cause. The review of water level data plots will typically be performed on a computer monitor.

Any identified problematic trend in water levels will typically be reported to the site Operations Manager who will work with his staff to reverse the affects. The magnitude of change which will trigger an action is somewhat subjective. A change in water level will be relative to operational activities such as the start up or shut down of a header house or a pump test in an adjacent mine unit. Basic to the review is the baseline water level data and, more importantly, the trending of the water levels (The baseline water level will be included in all plots used to assess water balance). Irrespective of operational activities, the reviewer will look for significant changes in water level (approximately ten feet or more). The reviewer will also look for water level changes the show that baseline water levels have been exceeded. In the event that baseline water levels are exceeded or if there is a water level change of greater than 10 feet, an investigation will be performed. Corrective actions will be taken as dictated by the results of the investigation.

Methods for trend reversal include modifying pattern balance in the region and increasing localized bleed. In particular, a trial and error system involving modifying injection and bleed patterns will be used to determine the exact location of the problem, i.e., the injection wells near the mounding would be turned off one at a time and the effects on the water level noted until the appropriate well or combination of wells was found. These wells and their associated patterns would then be re-balanced to properly affect the balance in the monitor wells. Also included in this process is the review of well completion records, area geology and well history to insure no issues exist with any of the well placements or completions.

Additional controls may include detailed monitoring of water levels adjacent to new production areas during the first two weeks of start-up, installation of observation wells as deemed hydrologically pertinent and/or installation and full-time monitoring of permanent piezometers in wells of concern.

1.3 Header Houses (GEIS 6.3.2; OP 3.6)

Header houses are the interface and measurement point between the Plant, pipelines and the well patterns. Each header house will consist of an injection and production header where the lixiviant will go to/come from the wells. The houses will also be the point where power control, instrumentation and oxygen distribution will occur. The attached **Figure OP-A2-3** depicts the header house instrumentation systems in general form.

1.3.1 Pattern Balance

This balance is the key component to maintaining hydrologic control within header houses and the mine units. Several tools will be used in pattern balance: individual well flow rates, monitor well water levels and overall bleed. The individual well flow rates are gathered when the fluid from/to each well travels through its "meter run" and the flow rate is measured. Monitor well water levels are obtained (prior to constituent sampling) approximately every two weeks and bleed is the amount of fluid removed from the system to insure a cone of depression in the pattern area. The engineering control aspects of pattern balance are: flow design, flow control, flow measurement, monitor well sampling and bleed as outlined in the following subsections.

1.3.1.1 Flow Design

Once the well patterns are installed, the designing engineer and operations staff will designate "balanced" flow values for each injection well based on the associated production flow rate. **Figure OP-A2-4** details the process for flow determination. Flow rates may be modified from the original, theoretical balance in the event that monitor well water level data shows an imbalance in the field. The Operations staff will work to adjust the injection/production balance to reduce outward flow toward the monitor wells. This is typically performed in small increments to verify the change will affect the appropriate response in the ring. The change may come in the form of a localized reduction in injection, a localized increase in production, or some combination of each.

1.3.1.2 Flow Control

Wellfield operators will inspect each house daily to physically monitor and adjust the flow in the wells. They will review the pattern balance based on production well performance and adjust the injection wells accordingly. If special balance conditions exist such as excursion control or monitor well water level "mounding", the operator may be required to operate a group of patterns in an underbalanced mode. In other words, the injection well flow rates will be set below the balance level to increase the localized bleed. The operator will use a control valve and the flow meter reading on the injection meter run to set each individual injection well rate. In this case, the operations staff may obtain additional monitor well (including overlying and underlying) water level data to substantiate the changes made in pattern balance and confirm that the changes are providing the appropriate response.

1.3.1.3 Flow Measurement

This measurement will occur via a flow meter installed on each injection and production meter run. Wellfield operators will inspect each house daily to physically monitor the flow in the wells. In addition, the flow data will be transmitted to the Plant computer for review, analysis, and alarm. Additional bulk measurement (See Section 1.1.1) will occur on the injection and production header to facilitate comparison against Plant flow for pipeline leak detection.

1.3.1.4 Data Comparison and Review

Data analysis will occur after the flow data has been transmitted to the Plant computer system for the following:

Individual Wells

Comparative analysis will be used to monitor for significant changes in individual well flow rates. A significant change could be an indicator of an upset condition either inside the header house or in the piping between the header house and the well head. Changes of this nature will cause an alarm and the wellfield operator will be notified for visual inspection of the well and/or to reset the well to the appropriate flow rate for proper balance.

Pattern Balance

The transmitted data will be used by operations staff to review pattern balance. This will be used in conjunction with monitor well water level data to insure the balance does not have a negative effect on fluid migration. As noted above, this may result in routine daily adjustments or modifications in pattern balance as well.

1.3.1.5 Monitor Well Sampling

Normal monitor well sampling will occur at least twice per month, and no less than ten days apart. Sampling consists of obtaining a static water level followed by a monitor well sample to be analyzed for the excursion constituents. The water level will be compared to previous water levels as well as other water levels in the mine unit. A change in water level will be relative to operational activities such as the start up or shut down of a header house or a pump test in an adjacent mine unit. Irrespective of operational activities, the reviewer will look for significant changes in water level (approximately ten feet or more).

1.3.1.6 Bleed

Bleed, or the net amount of fluid withdrawn from the production system, is estimated to be between 0.5 and 1.5 percent. This volume may vary based on responses to operational activities as seen through water levels in the monitoring ring, but is generally anticipated to be at 1 percent of the total injection/production flow through the plant. The bleed is taken to create a cone of depression within the production zone and pull groundwater towards the patterns. This is true for not only the production horizon, but also for the overlying and underlying formations if leakage exists to those zones. As previously stated, bleed may be locally elevated by either increasing production or decreasing injection within a pattern or group of patterns to reduce hydrologic mounding.

1.3.2 Pressure Control

Controls exist within the header house to insure that operational pressure requirements are not exceeded for: lixiviant injection and production and for oxygen injection, as outlined in the following subsections.

1.3.2.1 Lixiviant Injection

Pressure on the injection header will be measured and transmitted to the Plant control room for comparison with the

Plant pipeline exit pressure. If the difference, less losses for elevation and friction, are significant then an alarm will be generated. This may be an indication of a pipeline leak or non-functioning equipment.

Low Pressure

A low pressure switch will be installed on the injection header. It is designed to alarm (locally and at the Plant) for a leak on the injection system as well as interlock with the oxygen system to insure oxygen injection occurs only in conjunction with lixiviant injection. This switch will also interlock with the injection control valve and shut flow off (in operational mode) to the injection header to minimize the volume in case of a spill. OP 3.4 and OP 3.6.1 discuss the pressure levels partially established by MIT and pressure monitoring at the header.

High Pressure

A high pressure switch will also be installed on the injection header. It is designed to shut down injection via the control valve to insure all regulatory pressure requirements are met. Those requirements are detailed in OP 3.4 and OP 3.6.1. High pressure alarms will be generated locally and at the Plant.

1.3.2.2 Lixiviant Production

Pressure on the production header will be measured and transmitted to the Plant control room for comparison with the Plant pipeline entrance pressure. If the difference, less losses for elevation and friction, are significant then an alarm will be generated. This may be an indication of a pipeline leak or non-functioning equipment.

Low Pressure

A low pressure switch will be installed on the production header. It is designed to alarm (locally and at the Plant) for a leak on the production system or to indicate an electrical problem causing the production pumps to not operate properly.

High Pressure

A high pressure switch will also be installed on the production header. It is designed to shut down production via the motor control center to insure piping pressure ratings are not exceeded. High pressure alarms will be generated locally and at the Plant.

1.3.2.3 Oxygen Injection

The oxygen system in each header house will have solenoid operated valves that will close in the event of a power loss or injection flow shutdown. This will prevent the continued delivery of oxygen to the pipeline when the field is not operating. High and low data points will be set for oxygen injection piping within the header houses. If pressures are outside the set points, operators will be notified via alarm and will address the upset condition.

1.3.3 Leak Detection (OP 3.5)

Mine unit leak detection is focused in three main areas: pipelines feeding the mine unit and Plant, header houses and pattern areas. The engineering controls associated with each area are:

1.3.3.1 Pipelines

Leak detection will occur in the form of flow and pressure measurement and comparison. If changes occur in the measured variables, then an alarm will occur. Additionally, more conventional methods of leak detection occur continually during production operations. Standard operating procedures (SOP's) will require routine inspection of pipeline right-of-ways (ROWs) and valve station inspections. Operators will be trained to look for leak indicators in their visual inspections of pipeline ROWs.

Flow

Flow will be measured at pipeline entrance and exit points at the Plant and the header houses. Flow data from the header house will be transferred to the Plant and compared through the Plant PLC to determine if a leak is present. If the change in flow is beyond the set point (allowing for accuracy in the measurement devices), then an alarm will occur.

Pressure

Pressure will be measured at pipeline entrance and exit points at the Plant and the header houses. Pressure data from the header house headers will be transferred wirelessly to the Plant and compared through the Plant PLC to determine if a leak is present. If the change in pressure is beyond the set point (allowing for friction and elevation), then an alarm will occur.

1.3.3.2 Header Houses

Leak detection will occur in the form of pressure and flow measurement and comparison as well level indication in the sump. If changes occur in the measured variables, then an alarm will occur. Additionally, more conventional methods of leak detection occur continually during production operations. Standard operating procedures (SOP's) will require inspection of each header house each shift. Operators will be trained to look for leak indicators in their visual inspections.

Flow

Flow is measured at each well meter run and on the injection and production headers. As discussed above, comparative analysis is used to determine if significant changes exist and alarms will occur. Wellfield operators are notified upon alarm and a visual inspection is required to determine the nature of the upset condition.

Pressure

Pressure is measured on the injection and production headers and is transmitted to the Plant. Pressure switches are used to detect upset conditions in the headers. If the injection header appears to have a failure, the injection control valve will close and stop lixiviant flow to the header house. If the production header pressure is above or below the pressure switch set points, then the motor control center will be shutdown which will, in turn, shut all production well flow to the header house. Wellfield operators will be notified upon alarm and a visual inspection will be required to determine the nature of the upset condition.

Sump

The sumps should be dry; therefore, water levels and the operating status of the sump pumps in the header house basements will be monitored and transmitted to the Plant for review and alarm. A low level indication in the sump will initiate an alarm as well as begin pumping sump fluid into the production header. A high sump level will continue to alarm but will also shut down flow into and out of the header house.

1.3.3.3 Pattern Areas

Leak detection will occur via flow and pressure measurements and via wellhead equipment at each well. SOP's will require inspection of each header house each shift. Operators will be trained to look for leak indicators in their visual inspections.

Flow

Flow will be measured at each well meter run. As discussed above, comparative analysis will be utilized to determine if significant changes exist and alarms will occur. Wellfield operators will be notified upon alarm and a visual inspection will be required to determine the nature of the upset condition.

Pressure

Pressure indication is available on each meter run and will also be used as an indicator of a potential leak. Pressure is not a good leak indicator on injection wells, as they may operate at different pressures depending upon recent workover status and reservoir loading. The same is true of production wells as a drop in pressure could be an indicator of a failed pump, a failure in the downhole tubing used to support the pump or a failure in the piping from the well. Any changes in pressure data will be noted by operators and visual inspections of lines and systems will be completed to insure system integrity.

Wellheads

Each wellhead (injection and production) includes leak detection into its construction. Each wellhead cover includes a catch - basin and an alarm contactor. The contactor's circuit will complete if fluid is present in the catch-basin and a local and Plant alarm will occur. A wellfield operator will be notified upon alarm and a visual inspection will be required to determine the nature of the upset condition.

2.0 Plant

2.1 Ion Exchange (GEIS 2.4.2.1)

2.1.1 Flow / Water Balance

As pregnant lixiviant (also called production concentrate [PC]) from the production wells enters the ion-exchange circuit, it is sent to the ion-exchange columns. The lixiviant exiting the ion-exchange columns normally contains less than 5 mgL of uranium. The PC flow rate is monitored entering the Plant and at each of the ion exchange columns. This is the total flow from the header houses, i.e. the production wells. The flow rates will be compared through the PLC and an alarm generated if the difference is outside the set point (based on meter accuracy). The purpose of this comparison is to look for pipeline leaks between the header houses and the Plant by comparing total well field production well output to total Plant input.

The barren lixiviant (also called injection concentrate [IC]), is recharged with oxidant and bicarbonate, and is returned to the well field for reinjection. The production bleed is removed downstream of the ion-exchange columns, before re-injecting the barren lixiviant into the well field. The total bleed is estimated to be between 0.5% and 1.5% of the total well field production flow. IC flow rate is monitored leaving the Plant and, similar to the PC, is compared to the IC flow rates at the header houses through the Plant PLC. An alarm will be generated if the difference is outside the set point (based on meter accuracy). The purpose of this comparison is to look for pipeline leaks between the Plant and the header houses.

2.1.2 Pressure

Pressure readings will be utilized in a comparative manner to determine if an upset condition exists (leaking pipeline, fitting or valve) in the well field piping similar to the flow comparison. Entry and exit pressures for IC and PC lines at the header houses will be monitored and compared to the Plant IC and PC pressures through the PLC with allowances for friction and elevation changes. An alarm will be generated if the difference is outside the head loss allowances.

2.2 Elution (GEIS 2.4.2.2)

After the resin is loaded with uranium, it enters the elution circuit where the uranium is washed (eluted) from the resin, and the resin is made available for further cycles of uranium absorption. The resin will be transferred to a separate elution tank where the uranium is removed from the resin by flushing with a concentrated brine solution (eluant). After the uranium has been stripped from the resin, the resin may be rinsed with a sodium carbonate or bicarbonate solution. This rinse removes the high chloride eluant physically entrained in the resin and partially converts the resin to bicarbonate form. The resulting uranium-rich solution is termed pregnant or rich eluant. After enough pregnant eluant is obtained, it is moved to the precipitation, drying, and packaging circuit. All facets of the elution system are monitored to optimize chemical usage and minimize water usage. Monitored parameters include, but are not limited to: flow rates, fluid volume/level, pH and pressure. These types of engineering controls are designed to reduce waste disposal water and thus overall water consumption.

2.3 Precipitation (GEIS 2.4.2.3)

In the precipitation circuit, the pregnant eluant will be acidified to destroy the uranyl carbonate complex. Hydrogen peroxide (H2O2) is then added to precipitate the uranium as uranyl peroxide. Caustic soda (NaOH) is also added at this stage to neutralize the acid remaining in the eluate. The (now barren) eluant is recycled. Water left over from these processes will be reused in the eluant circuit or added to the waste stream to be included in deep disposal. All facets of the precipitation system are monitored to optimize chemical usage and minimize water usage. Monitored parameters include, but are not limited to: flow rates; fluid volume/level; pH; and slurry density. These types of engineering controls are designed to reduce waste disposal water and thus overall water consumption.

2.4 Slurry Storage (GEIS 2.4.2.3)

After the precipitation process, the resulting slurry is washed, filtered, and dewatered. At this point, the slurry is 30 to 50% solids. This thickened slurry will be stored in tanks in preparation for transport offsite to a uranium processing facility to produce yellowcake. Process water will be reused as possible in the elution and precipitation circuits. Filter press wash times will be minimized through monitoring of fluid flow rates and pressures as well as routine conductivity measurement on the filter press wash water discharge. Conductivity is a direct indication of chloride and thus the slurry cleanliness.

2.5 Waste Water Disposal (GEIS 2.4.3)

Uranium mobilization and processing produce excess water that must be properly managed. The production wells extract slightly more water than is re-injected into the host aquifer, which creates a net inward flow of groundwater in the well field. This production bleed is about 0.5 to 1.5% of the circulation rate. The production bleed is diverted after the uranium is removed in the ion-exchange resin system, but before the lixiviant is recharged. This water still contains lixiviant and minerals leached from the aquifer. The excess water will go through secondary ion exchange for further uranium capture prior to being stored for deep well disposal or to be treated further through reverse osmosis. Permeate from reverse osmosis may be used for Plant makeup water or restoration purposes. Other liquid waste streams produced during ISL operation can include spent eluant from the ion-exchange system and liquids from process drains. These are handled in the same manner as the production bleed.

Specifically, the Lost Creek Project waste water disposal system will consist of two storage tanks inside the Plant, two lined storage ponds adjacent to the Plant and a network of up to five deep disposal wells located around the Permit Area as well as the transfer and injection pumps. Engineering controls for each aspect will function as follows:

2.5.1 Plant Storage Tanks

Each of the tanks will be equipped with high and low fluid level indication that will interlock with feed and transfer pumps to either limit water coming into the tanks and/or transfer water going out of the tanks to the storage ponds and/or the deep disposal wells. A low level will shut down the pumps that transfer fluid to the storage ponds or feed the deep disposal injection pumps. A high level will shut down the waste water feed pumps. High and low fluid levels will alarm to the Plant Operator and pump status will also display on the Operator's screen.

2.5.2 Lined Storage Ponds

The lined storage ponds, Section OP 5.2.3.1, will be installed as additional waste fluid storage in the event deep disposal capacity is disrupted. The primary reasons for use will be falloff testing of disposal wells or well failure(s). The Storage Ponds will be lined and equipped with a leak detection system. During operations, the leak detection standpipes will be checked for evidence of leakage. Visual inspection of the pond embankments, fences and liners and the measurement of pond freeboard will also be performed during normal operations. The criteria for determining if a leak has been detected include both water level and water quality criteria. If there is an abrupt increase in the water level in one of the leak detection standpipes or if six or more inches of water are present in one of the standpipes, the water in that standpipe will be analyzed for specific conductance. If the specific conductance is more than half the specific conductance of the water in the pond, the water will be further sampled for chloride, alkalinity, sodium, and sulfate. In addition, the liner will be immediately inspected for damage and the appropriate agencies will be notified. Upon verification of a liner leak in one of the ponds, the water level in that pond will be lowered by transferring the contents to the other pond and/or to the UIC Class I wells.

With respect to pond overflow, SOPs will be such that neither pond is allowed to fill to a point where overflow is considered a realistic possibility. Flow rates to and from the storage ponds will be monitored and pump status will also display on the Operator's screen. Since the primary disposal method will be the UIC Class I wells, the flow rates to the pond are expected to be minimal; and there will be sufficient time to reroute the flow to another pond, or to modify Plant operations to reduce flow for the critical period. If precipitation is excessive, the freeboard allowance of the ponds will be designed to contain significant quantities of precipitation before an overflow occurs. The freeboard allowance will also reduce the possibility of water blowing over the pond walls during high winds.

2.5.3 Deep Disposal Well System

Up to five total deep disposal wells are planned for the Lost Creek Project. The wells are monitored in accordance with the requirements of the UIC Class I permit; and an evaluation of the well performance is included in the Annual Report submitted to NRC and WDEQ. Each well installation consists of a deep disposal well, an injection pipeline, pump house with injection pump and a feeder pipeline from the Plant.

2.5.3.1 Deep Disposal Wells

Each well consists of steel casing with perforations into the receiver formation, with injection tubing and a packer to deliver the waste fluid to the receiver and to form a casing annulus. The annulus will be filled with corrosion inhibited fluid. The wellhead (injection) and annulus pressure will be transmitted to the Plant wirelessly where it will be monitored and trended and where alarms will occur if either exceeds limits. The injection pressure limit is detailed in the Class I UIC permit and is based on the fracture pressure and gradient. The annular pressure is monitored as a secondary means of maintaining mechanical integrity. If the pressure in the annulus equals the injection pressure then a failure in either the tubing or packer or both has occurred and repairs will be required.

2.5.3.2 Injection Pipeline

This pipeline consists of high pressure steel piping rated for the transfer of the waste fluid between the pump house and the well. This pipe will be buried approximately six feet below surface and will typically be less than 100 feet in length. Pressure readings at the pump house discharge and at the wellhead will be compared using the Plant PLC to determine if there is a leak. A pressure drop greater than the allowance for friction and elevation head will generate an alarm and the injection pump will be shut down.

2.5.3.3 Pump House

The pump house consists of a skid type building, motor control center, high pressure injection pump, instrumentation, leak detection, and suction and discharge piping. The following parameters are monitored: suction pressure (pump inlet pressure); suction flow rate; discharge pressure;, sump level; and pump status. All data will be transmitted wirelessly to the Plant for monitoring, trending and alarming. Suction pressure and flow rate will be compared to pressure and flow data at the Plant to determine if there is a pipeline leak. If either parameter exceeds set points which allow for friction and head loss, then an alarm will be generated and the pump(s) will be shut down. Sump level will also be monitored to two stages: low and high. A low level in the sump will alarm the Plant operator of the condition. A high level will initiate shut down of the pump(s).

2.5.3.4 Feeder Pipeline

This pipeline consists of a buried pipeline, typically HDPE, from the Plant to each well. This line may feed more than one disposal well. Pressure and flow at the start and end of the pipelines will be compared through the Plant PLC to determine if a leak is present. If the change in pressure is beyond the set point (allowing for friction and elevation), then an alarm will occur and the pump(s) will be shut down.

2.6 Restoration (GEIS 2.5)

The objective of restoration is to return the affected groundwater to the uses for which it was suitable before commencement of Project operations. The Plant restoration systems (ion exchange, reverse osmosis filtration, storage tanks, and degassers) are used to achieve this goal, and the engineering controls for each are outlined in the following subsections.

2.6.1 Ion Exchange

This system consists of two ion exchange columns designed to remove the majority of any remaining uranium from the stream. The incoming fluid flow rate is monitored entering the Plant and at each of the ion exchange columns. This is the total flow from the restoration header houses. The flow rates will be compared through the PLC and an alarm generated if the difference is outside the set point (based on meter accuracy). Pressure is also monitored as a secondary means of leak detection. The purpose of this comparison is to look for pipeline leaks between the header houses and the Plant by comparing total well field production well output to total Plant input. The barren fluid is then pumped to the reverse osmosis system for filtration.

2.6.2 Reverse Osmosis (RO)

The RO system consists of pre-filtration, pumps, instrumentation and semi-permeable membranes. The RO process yields two fluids: clean water (permeate) that can be re-injected into the aquifer and water with concentrated ions (brine) that cannot be re-injected directly. The following instrumentation (pressure transmitters, pressure gauges, conductivity meters, and flow meters) will be part of the reverse osmosis system.

2.6.2.1 Pressure Transmitters

The transmitters on the system feed and discharge will be monitored, trended and alarmed through the PLC. Operation outside of set points will alarm the Plant operator and may cause an automatic shutdown of feed and discharge pumps depending on the severity of the reading.

2.6.2.2 Pressure Gauges

The gauges on the pumps, feed, interstage and discharge and on the required pre-filtration will support operation of the system.

2.6.2.3 Conductivity

Conductivity of permeate and feed will be monitored and alarmed through the PLC. Operation outside of set points will alarm the Plant operator and necessitate review of the RO performance. This may trigger additional cleaning of membranes.

2.6.2.4 Flow

Flows of permeate and concentrate will be monitored, trended and alarmed through the PLC. Operation outside of set points will alarm the Plant Operator and may cause an automatic shutdown of one or more of the pumps.

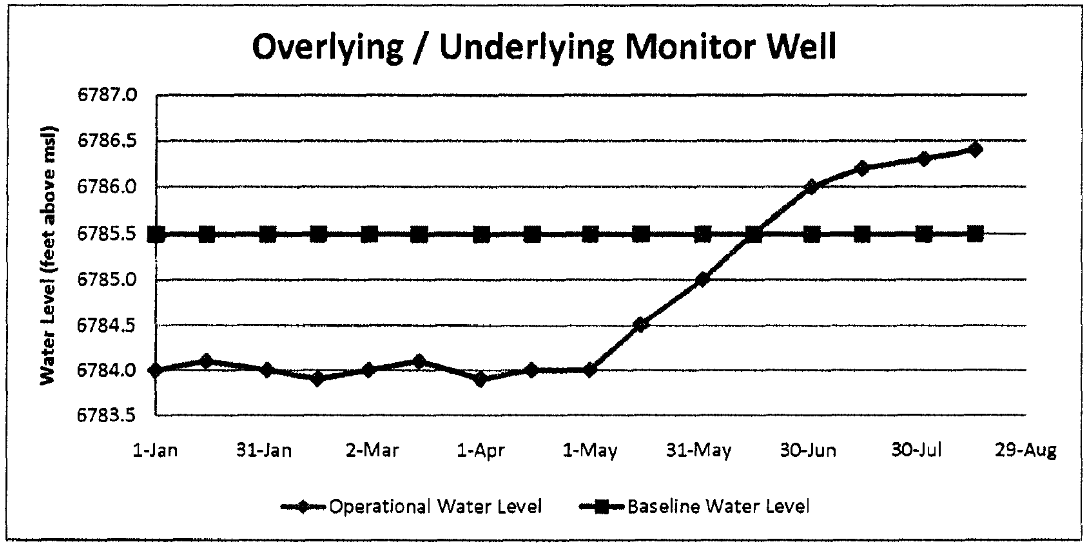
2.6.3 Storage Tanks

Permeate and brine streams will each be stored in tanks prior to shipment. The brine will be added to the waste water tanks previously discussed in Section 2.5 (Waste Water Disposal). The permeate tank will be equipped with high and low fluid level indication that will interlock with feed and transfer pumps to either limit water coming into the tanks and/or transfer water going out of the tanks to the wellfield. A low level will shut down the pumps that send fluid to the wellfield for reinjection as part of the restoration process. High and low fluid levels will alarm to the Plant Operator and pump status will also display on the Operator's screen.

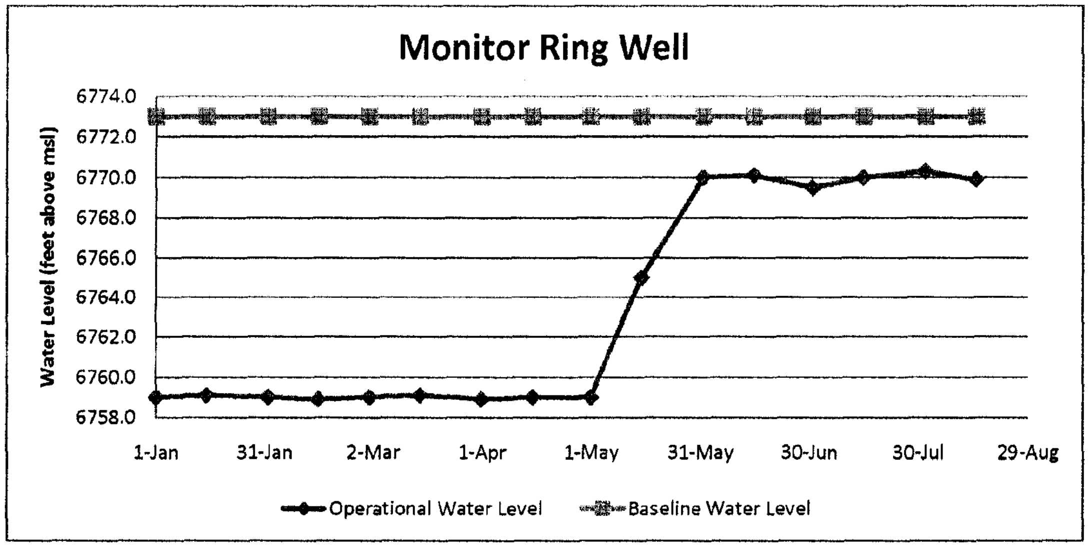
2.6.4 Degasser

The purpose of the degassers is to liberate carbon dioxide and moderate pH prior to permeate reinjection. The units will monitor, trend and alarm pH and pressure through the Plant PLC.

FIGURE OP-A2-1 Example of Change in Water Level in Monitoring Wells

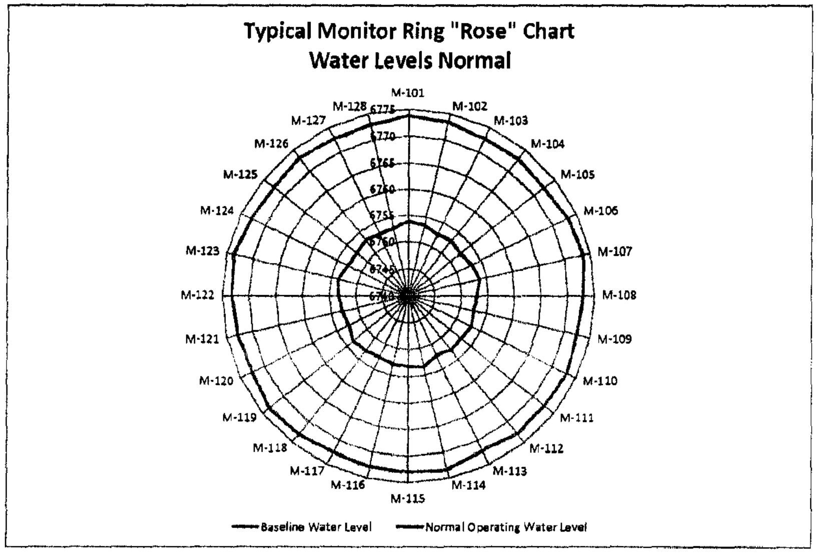


Date	Water Lvl	Change
1-Jan	6784.0	
15-Jan	6784.1	0.1
1-Feb	6784.0	-0.1
15-Feb	6783.9	-0.1
1-Mar	6784.0	0.1
15-Mar	6784.1	0.1
1-Apr	6783.9	-0.2
15-Apr	6784.0	0.1
1-May	6784.0	0.0
15-May	6784.5	0.5
1-Jun	6785.0	0.5
15-Jun	6785.5	0.5
1-Jul	6786.0	0.5
15-Jul	6786.2	0.2
1-Aug	6786.3	0.1
15-Aug	6786.4	0.1



Date	Water Lvl	Change
1-Jan	6759.0	
15-Jan	6759.1	0.1
1-Feb	6759.0	-0.1
15-Feb	6758.9	-0.1
1-Mar	6759.0	0.1
15-Mar	6759.1	0.1
1-Apr	6758.9	-0.2
15-Apr	6759.0	0.1
1-May	6759.0	0.0
15-May	6765.0	6.0
1-Jun	6770.0	5.0
15-Jun	6770.1	0.1
1-Jul	6769.5	-0.6
15-Jul	6770.0	0.5
1-Aug	6770.3	0.3
15-Aug	6769.9	-0.4

Figure OP-A2-2 Example of Rose Diagrams - Normal and Mounding Conditions



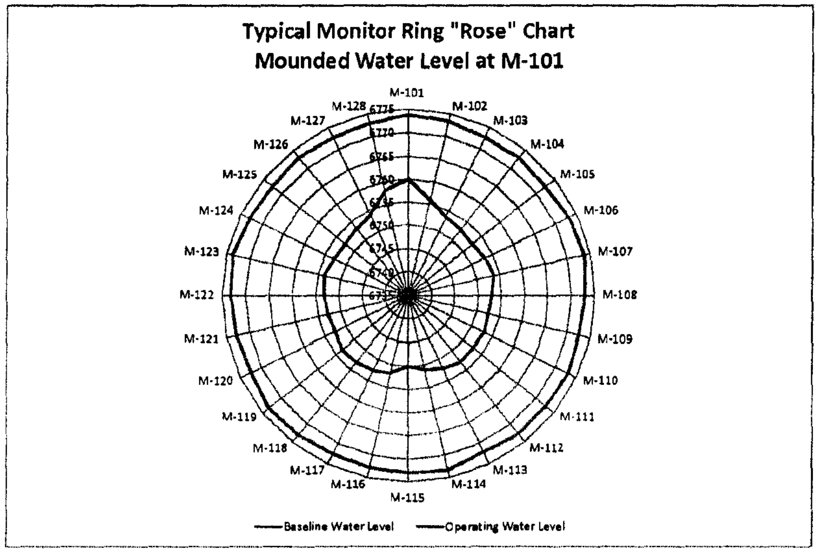


Figure OP-A2-3 Schematic of Header House Instrumentation

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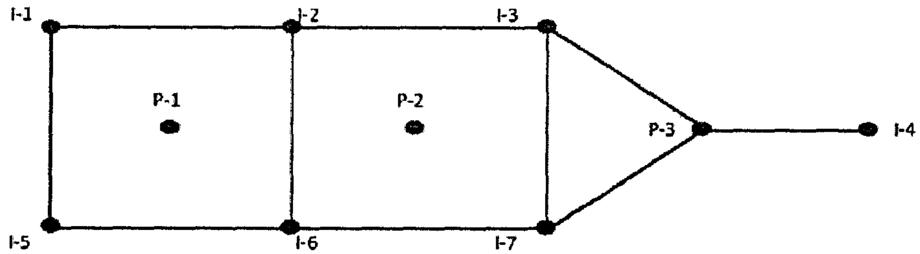
Figure OP-A2-4 Example of Pattern Balancing



P-1 Flowrate	30 gpm			
P-2 Flowrate	24 gpm			
P-3 Flowrate	36 gpm			
I-1 Flowrate =	25% of P-1 =	.25 * 30 =	7.5 gpm	
I-2 Flowrate =	25% of P-1 =	.25 * 30 =	7.5 gpm	plus
	25% of P-2 =	.25 * 24 =	6 gpm	
			13.5 gpm	
I-3 Flowrate =	25% of P-2 =	.25 * 30 =	6 gpm	plus
	33% of P-3 =	.33 * 36 =	12 gpm	
			18 gpm	
I-4 Flowrate =	33% of P-3 =	.33 * 36 =	12 gpm	
I-5 Flowrate =	25% of P-1 =	.25 * 30 =	7.5 gpm	
I-6 Flowrate =	25% of P-1 =	.25 * 30 =	7.5 gpm	plus
	25% of P-2 =	.25 * 24 =	6 gpm	
			13.5 gpm	
I-7 Flowrate =	25% of P-2 =	.25 * 30 =	6 gpm	plus
	33% of P-3 =	.33 * 36 =	12 gpm	
			18 gpm	

FIGURE OP A2-5, rev 2 - 111510

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