Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD)
Memorandum

File: Lost Creek ISR, LLC – WDEQ/LQD Permit 788
To: John Saxton, NRC
From: Melissa Bautz, WDEQ/LQD
Date: December 9, 2013 MLB
Subject: Excerpts from WDEQ/LQD Permit 788 – Lost Creek ISR Project

In response to our telephone conversation earlier today (see telephone conversation record dated December 9, 2013), I have copied excerpts from Lost Creek ISR's (LCI's) Permit 788. Specifically, I have provided portions of the Permit document that address the requirement to maintain a bleed at the mine. This is being submitted to you in the context of the recent discovery (during NRC's site inspection at the Lost Creek site last week) that the site is currently operating with a zero bleed. Table 1 below describes the page that are attached as well as their significance with regard to the required bleed for the Lost Creek Project.

Table 1. Summary of select portions of the Lost Creek ISR project's Permit 788

Page/Figure Number	Section	Explanation
Page OP-44	OP 3.6 Mine Unit Control	This section of the Permit states that bleed (overproduction in the system) is the "most basic aspect of mine unit control". Specifically, this section states that a bleed rate of 0.5 – 1.5 percent is "anticipated".
Pages OP-56, 57	OP 3.6.3.1 Water Balance	This section of the Permit addresses the project water balances during different mining phases. It is predicated on a 1% bleed as indicated in the text on page OP-56 as well as on two water balance diagrams (Figures OP-5a and 5d, discussed below)
Page OP-59	OP 3.6.3.3 Cumulative Drawdown	This section of the Permit states that a bleed of 0.5 – 1.5% is expected to minimize the potential impact on groundwater. This section also indicates that the extraction of groundwater (maintenance of a bleed) will result in drawdown with the production zone aquifer. Lastly, this section states that a numerical model using a "net bleed of 38gpm or 0.65%" was applied to the project to assess cumulative drawdown. Again, a bleed of 0.5 – 1.5% is presented in this section of the Permit.
Figure OP-5a	Figures	This figure is the project water balance diagram for mining only. In the top left portion of the diagram, a 1% bleed is stated.
Figure OP-5d	Figures	This figure is the project water balance diagram for mining and RO operations running simultaneously. In the top left portion of the diagram, a 1% bleed is stated.

In summary, the WDEQ/LQD Permit for the Lost Creek Project is predicated on the maintenance of a 0.5 – 1.5% bleed (overproduction). The Permit does not indicate whether an "average" bleed can be invoked as adequate adherence to the Permit. However, common sense indicates the intent of the Permit language is for an "instantaneous" or ongoing bleed of 0.5 – 1.5%. In other words, it is WDEQ/LQD's interpretation that a zero bleed at any time during mining operations is contrary to the approved Permit.

Enclosures: Pages OP-44, 56, 57, 59 and Figures OP-5a and OP-5d from Permit 788

Cc: LQD Cheyenne → Permit 788 Correspondence File (w/encl)
Tanya King, WDEQ/LQD District 2 Supervisor → Permit 788 Correspondence File (w/encl)
Chron (w.o. / encl)

OP 3.6.3.2 Mine Unit Interference

Decisions about the order in which mine units will be brought on line and the rates at which they will be developed and restored will depend, in part, on the potential for interference among the mine units. As noted in **Section OP 3.2**, any particular concerns about interference will be addressed in the Hydrologic Test Proposal and Report.

OP 3.6.3.3 Cumulative Drawdown - Mine Unit Operations

As discussed in **Appendix D6**, a regional pump test has been conducted to assess the hydraulic characteristics of the HJ Horizon and overlying and underlying confining units. Pump tests also will be performed for each successive mine unit in order to assess hydraulic containment above and below the production zone, demonstrate communication between the pattern area and perimeter monitor wells, and to further evaluate the hydraulic properties of the HJ Horizon.

Based on a bleed of 0.5 to 1.5 percent, the potential impact from consumptive use of groundwater is expected to be minimal. In this regard, the vast majority (e.g., on the order of 98 percent) of groundwater used in the ISR production and restoration process will be treated and re-injected (**Table OP-6**).

During ISR operations, extraction of groundwater will result in drawdown within the production zone aquifer, and potentially, in the overlying and underlying aquifers. Additional drawdown will occur in aquifers that are pumped to the water supply requirements for dust suppression, drilling, plant process and wash water, and potable water. Drawdown estimates for the mine units are described below, and **Section 3.6.3.4** addresses drawdown related to water supply requirements.

Drawdown will be greatest in the immediate vicinity of the mine units. A numerical model was used to assess drawdown impacts from Lost Creek ISR operations. The model was developed using site-specific data based on geologic and hydrologic information collected from site characterization activities. The model development, calibration and simulations are described in the report "Numerical Modeling of Hydrologic Conditions at the Lost Creek In-Situ Recovery Uranium Project, Wyoming" found in Addendum 5-1 of the MU1 Volume. Simulations were run representing the full production-restoration sequence for Mine Unit 1. The simulation included a production phase at a maximum rate of 5,838 gpm (with a net bleed of 38 gpm or 0.65%) for a period of 26 months (791 days), groundwater sweep at 30 gpm for 12 months (365 days), and treatment with RO at 541 gpm for 18 months (548 days). The total simulation period was 56 months (4.75 years). During RO, the simulated consumptive use (reject brine)

Instrumentation systems will be key to monitoring and maintaining the multiple processes in the field (e.g., the mine units) and in the Plant. Plant and Field Operators will use the data and information provided by the instrumentation systems to better manage the work areas. Operator control of key elements will be maintained; and instrumentation will assist in controlling pump operating levels and valve operation. When operating parameters move outside a specified normal operating range, it will cause an alarm that notifies the operator to initiate corrective action to alleviate the problem. Indication of abnormal operational conditions will initiate automatic shutdown of the related equipment. The key design component of the system will be to minimize the risk of uncontrolled releases of leaching solutions or other solutions and provide maximum safety and protection to the operators, other site personnel and the environment.

OP 3.6 Mine Unit Control

The techniques, that will be employed to ensure each mine unit is operating as efficiently as possible, will include monitoring of: production and injection rates and volumes, manifold pressures, water levels, and water quality. These criteria may be evaluated at more than one level (e.g., by mine unit, by header house, by pattern, or by well) depending on the specific criteria.

The most basic aspect of mine unit control is the bleed system, e.g., overproduction. The bleed system will be used so the volume of injection fluid will be less than the volume of production fluid in a mine unit. The overproduction will result in an inflow of groundwater into the pattern area and help reduce the possibility of an excursion. The anticipated bleed rate is 0.5 to 1.5 percent. Overproduction will be adjusted as necessary to control the distribution of the lixiviant within the production zone.

Monitoring and alarm systems will be located at the header houses and transmitted to the plant either by hardwire, microwave or spread spectrum radio. Systems monitored in the header houses will include:

performance and restoration equipment usage to optimize restoration. Any changes to the schedule will be addressed as discussed in **Section OP 2.1** (Project Schedule).

The water balance for the Lost Creek Project is presented for six representative operational modes in **Table OP-6** (Water Balance Summary) and **Table OP-7** (Water Balance – Calculation Details). The water balance for the same six operational modes is illustrated in **Figures OP-5a**, **b**, **c**, **d**, **e** and **f.** The following discussion presents the correlation of the capacity requirements of the production and restoration schedules with the water/waste water treatment and disposal systems for each of the six representative operational modes.

Initially, the project should be ramped up to the nominal maximum production rate while no mine units are available for restoration activities. **Figure OP-4a** indicates this operational mode to occur during the first 26 months of operation. **Figure OP-5a** illustrates the "Production Only" project water balance representing early stage operations at the project. The net consumptive removal would be limited to the level of bleed required to control the flow of fluids within the mine unit(s) in production (1% of 6000 gpm = 60 gpm). The plant process water supply well contributes an additional 10 gpm to the water balance (in and out). The restoration plant is idle while waiting for the first mine unit to become available for groundwater restoration activities. There is insufficient flow available to operate a secondary RO unit. The gross consumptive use of groundwater is 70 gpm (60 + 10). It will be necessary to have an operational waste water disposal capacity of 70 GPM during this operational mode. Two disposal wells will be required. The net consumptive removal from the mine unit(s) contributing to the cumulative drawdown of the aquifer is 60 gpm (**Table OP-6**).

As the project matures, the first mine unit will be determined to be depleted and ready for groundwater restoration operations. Groundwater restoration will be initiated with the GWS phase to prepare a portion of the unit (one or more header house areas) for reverse osmosis treatment. The second operational mode (**Figure OP-5b**) is projected to last for only two-months (**Figure OP-4a**). Plant inflows (**Table OP-6**) will consist of 6,000 gpm of production, 30 gpm of GWS and 10 gpm of process water. Plant outflows will consist of 5940 gpm of injection, and 100 gpm of waste water. The restoration plant primary and secondary RO units will be idle due to insufficient available feed. The gross consumptive use of groundwater is 100 gpm (60 brine + 30 GWS + 10 process bleed). It will be necessary to have an operational waste water disposal capacity of 100 gpm during this operational mode. Three disposal wells will be required. The net consumptive removal from the mine unit(s) contributing to the cumulative drawdown of the aquifer is 90 gpm (**Table OP-6**).

As GWS is completed in a large enough portion of the first mine unit, the third operational mode as depicted in **Figure OP-5c** will be initiated. It is anticipated that production operations, restoration sweep and groundwater treatment (RO) will all occur contemporaneously for an extended period during the life of the project. In this operational mode, plant inflows (**Table OP-6**) will total 6610 gpm; consisting 6000 gpm of production, 30 gpm of GWS, 570 gpm of RO phase recovery and 10 gpm of process water. Plant outflows will also total 6610 gpm; consisting of 5940 gpm of injection to the production mine units, 555 gpm of permeate going to the restoration mine unit and 115 gpm of waste water. The gross consumptive use of groundwater is 115 gpm (105 brine + 10 process bleed). Three disposal wells will be required. The net consumptive removal from the mine unit(s) contributing to the cumulative drawdown of the aquifer is 105 gpm (**Table OP-6**).

Although not presently projected, production operations could occur with RO restoration but not GWS restoration as depicted in **Figure OP-5d.** This mode could occur if GWS was deemed complete in all available mine units but RO restoration requirements are ongoing. The water balance as a whole is not significantly changed by the shifting of the source of restoration recovered water from GWS to RO. The waste water requirements for this mode are unchanged from the operational mode illustrated previously.

Restoration operations will continue for a period of time after production operations are completed. **Figure OP-5e** illustrates the post-production mode when both GWS and RO restoration are active. The 200 gpm production RO Unit will be tied in to the restoration circuit to increase the rate of active restoration. In this operational mode, plant inflows (**Table OP-6**) will total 810 gpm; consisting of 40 gpm of GWS, 760 gpm of RO phase recovery and 10 gpm of process water. Plant outflows will also total 810 gpm; consisting of 700 gpm of permeate going to the restoration mine unit and 110 gpm of waste water. The gross consumptive use of groundwater is 110 gpm (100 brine + 10 process bleed). Three disposal wells will be required. The net consumptive removal from the mine unit(s) contributing to the cumulative drawdown of the aquifer is 100 gpm (see **Table OP-6**).

It would not be technically feasible to have restoration flow rates equal to production flow rates. The restoration processes produce a higher ratio of waste water to produced water than production processes, creating a more pronounced drawdown of the aquifer's piezometric surface. Therefore, to avoid 'pulling in' considerable quantities of unaffected groundwater (i.e., a higher bleed rate), dropping water levels below pumps; and other consequences of pronounced drawdown, the flow rate during restoration is not the same as the production flow rate. Further, restoration is expected to be completed in a fraction (2/10th) of the pore volumes it takes to complete production. If an operator restored wellfields at a flow rate equal to the production flow rate, the restoration circuit would be idle nearly 80% of the time and the required waste water disposal rate would be many

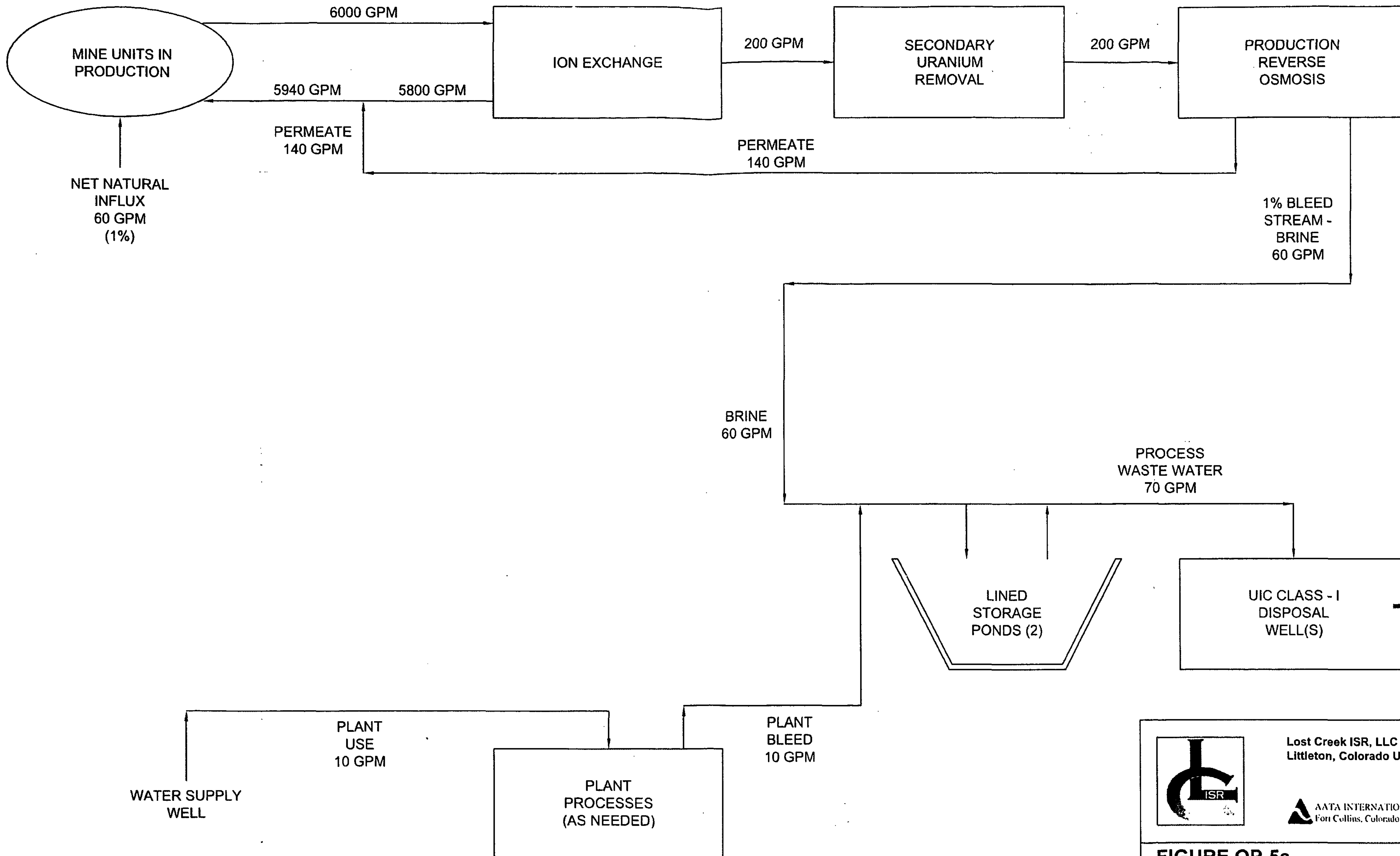

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FIGURE OP-5a
Project Water Balance
Production Only

Lost Creek Permit Area

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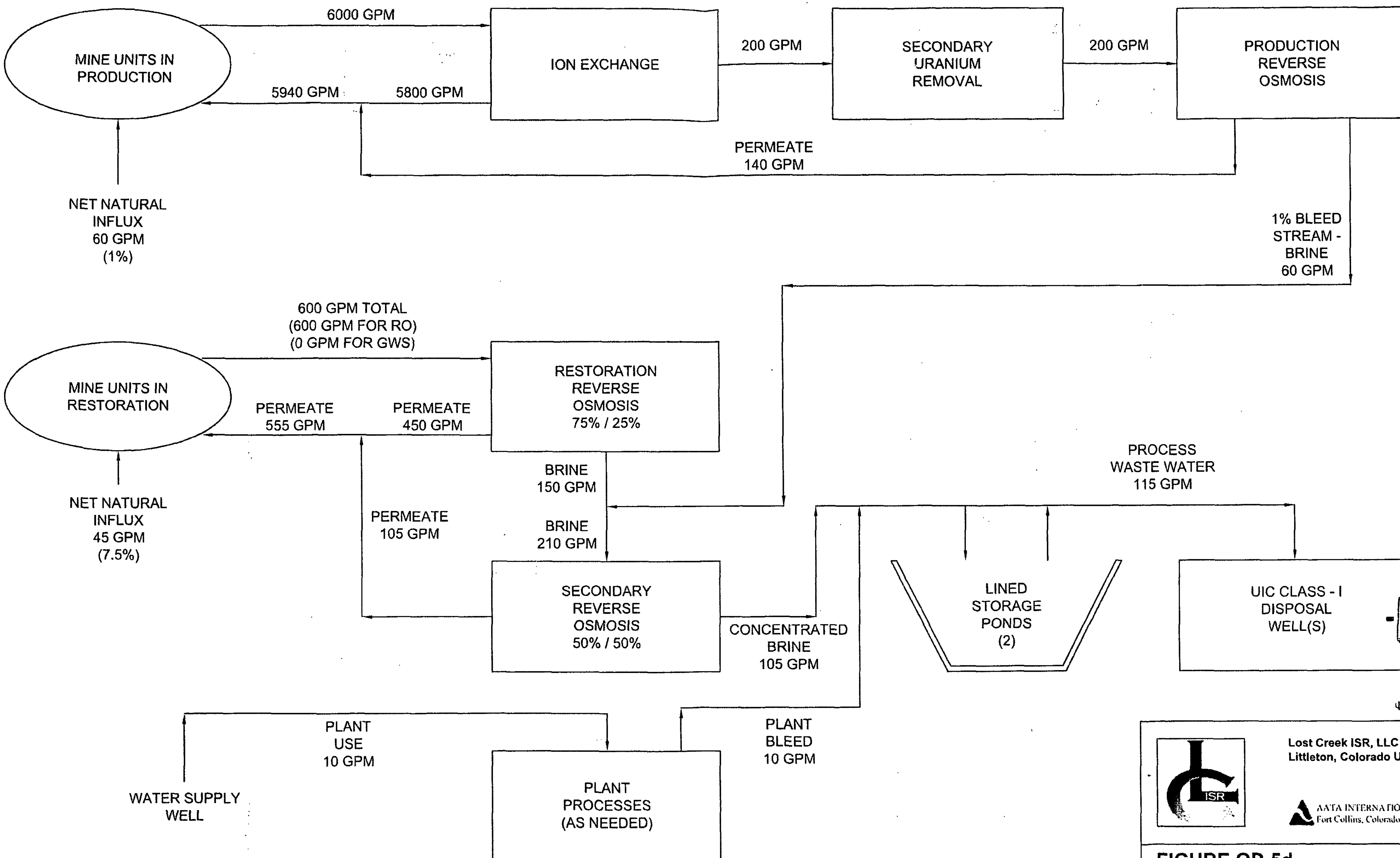

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FIGURE OP-5d
Project Water Balance
Production with RO
Lost Creek Permit Area

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