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4.0 EFFLUENT CONTROL SYSTEMS

During the Project, gaseous/airborne, liquid, and solid effluents will be produced from the processes associated with ISR operations. All the effluents are typical for ISR projects currently operating in Wyoming; and existing technologies are amenable to all aspects of effluent control in the Permit Area. Additional details about the types of effluents and storage, treatment, reuse/recycling, and disposal practices and their potential impacts are provided below.

Effluents will be reduced by minimizing disturbance and reusing/recycling materials whenever possible. On-site waste handling facilities will have proper storage to segregate the materials and signage to indicate the types of materials present. These areas will be routinely checked to ensure proper waste segregation and storage. All materials delivered to or transported from the facility, including wastes, will be packaged in accordance with US DOT requirements. Employees will receive training, guidance, and personal protective equipment (PPE) to safely handle, store, decontaminate, and dispose of waste materials. Employees will also be trained to recognize potential hazards and to perform assigned duties in a safe and healthy manner to help reduce the possibility of accidental release. Standard Operating Procedures (SOPs) will be accessible for guidance on routine activities, and for unusual circumstances, an approved work plan and/or approved Radiation Work Permit (RWP) will provide guidance for non-routine work or maintenance activities. Spill Prevention and Response Plans will also be in place to help reduce the possibility of accidental release and provide for appropriate action in the event of a release.

4.1 Gaseous Emissions and Airborne Particulates

Non-radioactive and radioactive airborne effluents are anticipated during the Project. Non-radioactive airborne effluents will be limited to gaseous emissions and fugitive dust. The radioactive airborne effluent will be radon gas. The types of effluents and the control systems that will be in place for them are summarized below.

4.1.1 Non-Radioactive Emissions and Particulates

Gaseous emissions will result from the operation of internal-combustion engines. Exhaust from diesel drilling rigs and other diesel or gasoline-fueled vehicles will produce small amounts of CO, SO_2, and other internal-combustion engine emissions. Regular maintenance, SOPs, and pollution prevention equipment will be used to reduce gaseous

emissions. Bussing of employees or credit for employee car-pooling will be considered to help reduce fuel consumption and emissions.

Most of the airborne particulates will be dust from traffic on unpaved roads and wind erosion of disturbed areas, such as during installation of wells at a mine unit. Restricted vehicular access and speed limits will be used to minimize dust from roads; and additional dust control measures may include water spraying, application of gravel, or application of organic/chemical dust suppressants. Disturbance will be minimized to the extent possible; and disturbed areas will be revegetated during the first available seeding window.

Airborne particulates may also include minor amounts of salt and soda ash releases during deliveries to the Plant, and drilling mud or cement dust during the installation of wells at the mine units. Construction activities may also generate airborne particulates. Examples of this might be welding fumes or dust from grinding on steel. Standardized delivery procedures that minimize material loss (and address health and safety concerns) and efficient construction practices will be used to minimize generation of such particulates.

An analysis of soda ash emissions shows that approximately 13.5 pounds of particulate will be released per year. The analysis assumes that 5.2 pounds of particulate is created per ton used, and 521.1 tons of soda ash will be used each year. Although 1.35 tons of particulate is created each year, a standard passive bag house filter will capture 99.5% of the material (using emission factors from EPA's AP-42, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources (EPA, 1995), resulting in a total emission of 13.5 pounds. A similar analysis of salt emissions, using a passive bag house filter, indicates that approximately 17.5 pounds of salt will be emitted per year.

Carbon dioxide and oxygen will be used as part of the extraction and concentration of uranium during mining; and hydrogen sulfide may be used during groundwater restoration after mining. However, use of these gases will be controlled to prevent waste and potential adverse safety conditions. Similarly, any fumes from the limited use of liquid chemicals, such as hydrochloric or sulfuric acid, will be controlled (e.g., laboratory hoods). Pressure venting at the mine units and supporting facilities will produce some non-radioactive gaseous emissions, such as carbon dioxide, oxygen, and water vapor, but the primary effluent of concern from pressure venting is radon gas, as discussed in more detail below.

4.1.2 Radioactive Emissions

Radioactive airborne effluents will be minimal, as compared to other ISR operations in Wyoming, in part because yellowcake drying and packaging will not occur within the Permit Area and because the Storage Ponds will be kept wet.

4.1.2.1 Particulates

Accident scenarios resulting in the exposure of a member of the public to airborne particulate in concentrations above dose limits established in 10 CFR 20.1301 are highly improbable given the remoteness of the facility and the engineering and administrative controls that will be employed. This conclusion is supported by Section 4.2 of NUREG/CR-6733, which discusses the potential sources of effluent resulting from accidents at an in situ facility. The NUREG considers several accident scenarios, of which the failure of a thickener tank (Section 4.2.1 in the NUREG) would be the most representative of a potentially large source of particulates from an accident at the Lost Creek Project, such as failure of a yellowcake slurry tank, as outlined below

Comparison of NUREG and Lost Creek Scenarios

The Lost Creek Plant will not have a thickener tank but will have tanks containing bulk quantities of yellowcake slurry. The authors of the NUREG, using extremely conservative assumptions, found that the only way the dose to a member of the public could occur from a thickener tank failure is if at least 20 percent of the thickener tank contents escaped the facility and a member of the public was less than one hundred meters from the accident. The nearest boundary to the Lost Creek Plant will be 333 meters away from the Plant. The scenario also assumes that there will be no timely accident response to recover the spill and the slurry will be allowed to dry. Given that the slurry storage tanks will be positioned a considerable distance from exterior walls and within a bermed area, it is highly unlikely that a ruptured yellowcake slurry tank could reach the outdoor environment. Further, LC ISR, LLC will have procedures for addressing such events and will train employees to follow the procedures in a timely manner. The containment volume within the Lost Creek Plant is outlined below, and the solubility of the Lost Creek product, as compared to the NUREG accident scenario, is also discussed below.

Containment Volume

Two slurry storage tanks are planned (**Plate 3.1-1**). The total containment volume of the bermed area will be enough to hold the contents of both slurry vessels if they were both

ruptured. The following numbers are approximate because they are rounded to work in whole numbers:

- Volume of one yellowcake slurry vessel ≈ 1,722 ft^3
- Volume of containment:
  - Area of precipitation/yellowcake slurry room: 39 ft x 178.5 ft ≈ 6,961 ft^2
  - Area taken up by tanks/filter presses/pumps/ramps ≈ 700 ft^2
  - Total useable area: 6,961 ft^2 – 700 ft^2 = 6,261 ft^2
  - Volume of sloping foundation: 0.5 x 6,261 ft^2 x 0.396 ft ≈ 1,240 ft^3
  - Minimum height of berm = 0.5 ft
  - Volume of bermed area: 0.5 ft x 6,261 ft^2 ≈ 3,130 ft^3
  - Volume of sumps (2 at 18 ft^3 each) = 36 ft^3
  - Total containment volume: 1,240 ft^3 + 3,130 ft^3 + 36 ft^3 = 4,406 ft^3

Solubility Assumptions

The NUREG accident scenario assumes insoluble uranium, the worst-case assumption. If the material involved in the accident were more soluble, the dose to a worker on-site would be reduced by the ratio of the more soluble annual average DAC to the insoluble DAC. The dose to a member of the public would be reduced by the ratio of the annual average effluent release limit for the more soluble uranium to the effluent limit for insoluble uranium. This is quantified below.

The products of interest are uranyl peroxide (UO_4), uranyl trioxide (UO_3) and/or their hydrates (not "U_3O_8") as a direct result of the elution and precipitation chemistry to be used. These products are historically considered much more soluble than U_3O_8. A detailed discussion of the relative solubility of these and related industrial uranium products is provided in **Sections 5.7.4** and **5.7.5** of this report.

Uranium exists in various oxide compounds depending upon the Eh and pH of the processing system as shown in the Pourbaix diagram (**Figure 4.1-1**). Additional assumptions stated in the thickener failure and spill scenario of NUREG/CR-6733 also would tend to "maximize" dose to both workers and the public relative to more realistic and credible emergency response circumstances at the Lost Creek Permit Area. This comparison is summarized in **Table 4.1-1**.

NUREG/CR-6733 Figure 4.2, reproduced as **Figure 4.1-2** in this report, indicates all doses to members of the public are well below any applicable standards, and would be further reduced to about 1 mrem per year if just solubility alone were considered and less if other factors presented in **Table 4.1-1** were taken into account.

With regard to potential on-site (occupational) doses, the analysis in NUREG/CR-6733 for an accident involving thickener failure shows a potential dose at the center of the spill, to someone standing in the spill for four hours after the spill had dried, could exceed 5 rem. The assumption is that the spill consists of insoluble Class Y U_3O_8. Reducing the dose estimate based on solubility considerations alone (ratio of DACs – see **Table 4.1-1**) results in a worker dose projection of about 500 mrem, not taking into account other credible emergency response mitigating actions as presented in **Table 4.1-1**. On page 4-22 of NUREG/CR-6733 it is stated that, "It is reasonable to assume that cleanup personnel would be outfitted with protective equipment including respirators." It is also likely that any spill would be cleaned up before it dried. The implication is that the dose is minimal while the spill is wet. Maintaining the spill "wet" during cleanup is an expected method of collection which will ensure dust control and minimize exposure potential. Air sampling during the cleanup process will provide a record of actual exposure.

Yellowcake Dryer

NUREG/CR-6733 also considers the risk of accidents involving a yellowcake dryer. Since LC ISR, LLC will not have a yellowcake dryer these scenarios are not applicable. Section 2.8.1 of NUREG/CR-6733 considers the yellowcake dryer and packaging system the normal source of airborne particulate at an in situ facility.

4.1.2.2 Radon

Radon will be the radioactive gaseous emission from the mining and ore processing, as it is present in the orebody and concentrated in the lixiviant solution. Radon will be released occasionally from the mine unit wells as gas is vented from the injection wells. Production wells will be continually vented to the surface; however, water levels will typically be low and radon venting will be minimal. All of the well releases will be outside of buildings and are directly vented to the atmosphere. Radon will also be released during ion exchange resin transfers and subsequent ore processing steps, as described in more detail below. Potential radon exposure will be reduced or eliminated with ventilation to the outside of the buildings using high-volume exhaust fans, PPE, and limited exposure durations, in accordance with SOPs, or in the case of an unanticipated release, an RWP.

The radon will be discharged into the atmosphere, where it will disperse rapidly. Occupational and public exposures to radon emitted from the mine units and from the ore processing were analyzed using the MILDOS computer model to ensure the discharged amount will be within regulatory dose limits (see **Section 7.2** Public and Occupational Health for results).

The work areas of concern for radon exposure are at the vents from: the bleed storage tanks, the resin transfer points, the fluid collection sumps, and the yellowcake slurry loading area, as well as low-lying areas and confined spaces. The bleed storage tanks will be used for temporary storage of the production bleed fluid. Because these tanks will be at atmospheric pressure (unlike other tanks in the ore processing circuits) and not always full, radon (as well as oxygen and carbon dioxide) present in the bleed fluid may be liberated into the headspaces of the tanks. Therefore, these tanks will be vented to the atmosphere outside the building via a stack. On non-pressurized tanks and sumps, the vent will be assisted by redundant exhaust fans to ensure continuous ventilation even in the failure of the primary exhaust fan. Discharge stacks will be located away from building ventilation intakes and will typically be several feet above roof level.

All redundant exhaust fans described in the above paragraphs will be of the same size and model as the primary exhaust fans. The redundant exhaust fans will be connected to the same power supply as the primary exhaust fans. The redundant fans will be in place to ensure ventilation when the primary fans go down for mechanical or maintenance reasons. In the event of a power loss, the emergency and critical processes will continue to run on the backup generator. Ventilation, including the primary and redundant exhaust fans, is considered a critical process and will be tied into the backup generator.

Resin transfer will occur when an ion exchange vessel is fully loaded with uranium and is transferred from the Ion Exchange Circuit to the Elution Circuit. The ion exchange and elution vessels are normally pressured columns. When ready for resin to be transferred, the pressure is relieved from the vessels via a manifold connected to a sealed knockout tank prior to leaving the building via a vent line. The knockout tank is used to ensure fluid particulate does not exit the building through the vent line. Because radon may be liberated during the transfer, ventilation will be provided at the resin transfer points and operated during the transfers. These will be in the form of hooded, redundant exhaust systems over each of the resin shakers on the shaker deck. Each of the exhaust fans will have a backup fan to ensure the removal of radon from the area. The design of the hoods and fans will take into account the capture velocity of radon at the furthest point of the shakers.

A sump will be used to collect any fluids released from the ion exchange vessels during resin processing, from tanks during maintenance procedures and from routine washdown of the area. To prevent radon accumulation, the sump will be covered and vented through stacks out of the Plant roof which have redundant exhaust fans to maintain a negative pressure on the sump. The yellowcake slurry will be transferred from storage tanks into trucks for transport to a drying and packaging facility. During this transfer, radon gas will potentially escape; so ventilation will be provided in the transfer area. The UIC Class I well pumphouses will also be vented.

In addition to the tank-specific ventilation described above, a general area ventilation system will be installed to keep radon levels As Low As Reasonably Achievable (ALARA) during routine operations and upset conditions. The general ventilation system will consist of fans distributed along exterior walls at floor level as shown in **Figure 4.1-3**. The fans will displace air in the plant by blowing it outside. The initial capacity of the general ventilation system will be sufficient to create six air changes per hour. Preliminary HVAC designs are included in **Attachment 4.1-1**, and show the location of all of the planned ventilation systems. The calculated air space is approximately 470,240 cubic feet. The fans, located at the center of the Plant on floor level, are sized to remove air from the building at a rate of 50,000 cfm (25,000 cfm each). This is enough to ensure six air changes per hour. For the tank specific ventilation, each area will typically be equipped with a utility set fan to remove the air. Each system will typically also have a redundant exhaust fan to allow for maintenance on the primary fan while maintaining ventilation. A summary of the preliminary fan specifications are in **Table 4.1-2**. All of the utility set fans will typically vent through a "knock-out" pot. The purpose of the "knock-out" pot is to ensure the fans are only venting air. The ducting from the tank and columns will go into a tank partially filled with fresh water. Any particulates or moisture will be trapped in the water in the "knock-out" pot, and the fans will just vent the air. The Radiation Safety Officer (RSO) will monitor air quality within the plant to determine if the installed general ventilation capacity is sufficient to maintain ALARA levels of radon during routine operations and to quickly expel the radon in an upset condition.

Due to the remoteness of the facility, the administrative and engineering controls to be implemented and the nature of ISR, the potential for a member of the public to be exposed to radon levels exceeding the limits outlined in 10 CFR 20.1301 is minimal. Radon is the only effluent which will be allowed to routinely leave the controlled site in a manner which may allow a dose to a member of the public. MILDOS modeling in **Attachment 7.3-1** of this report demonstrates that the possible dose at the nearest downwind Permit Area boundary from the Plant due to radon is 3 millirem (mrem) per year while the regulatory limit is 100 mrem/year. Operational monitoring for radon is described in **Section 5.7.3.2**.

NUREG/CR-6733 considers the risk involved with the spill of a large quantity of lixiviant and the resulting release of radon. The NUREG demonstrates that even if the spill event is uncorrected for eight hours the exposure to a member of the public at the boundary will be below regulatory limits. However, the dose to an employee may exceed regulatory limits if the spill is not handled properly. In order to ensure the dose limit is not exceeded, the engineering and administrative controls found in **Section 5** will be implemented; including the use of routine monitoring described in **Section 5.7.3.2** and the use of a Continuous Working Level (CWL) monitoring system. The CWL monitor will include an alarm system to alert employees of increasing radon levels. If the

working level for radon exceeds 25 percent of the Derived Air Concentration (0.08 Working Level), workers will open the garage doors and investigate to determine the source of the elevated radon. The RSO or Health Physics Technician (HPT) will be notified of the elevated radon level.

It is LC ISR, LLC's goal to minimize radioactive effluent during normal operations and upset conditions. To achieve this goal, LC ISR, LLC will design and operate the facility with the ALARA philosophy in mind. The facility will be designed to comply with accepted in situ industry practices; electrical, fire, and building codes; and all other applicable local, state, and federal regulations. Plant employees will be trained in carefully developed emergency response procedures so that any incident resulting in the release of radioactive material can be mitigated in a safe and timely manner. LC ISR, LLC will rely on the inspections detailed in **Section 5.3.1** to identify and correct potential operations problems that may result in a release of radioactive materials. All employees will be qualified to perform their assigned tasks in accordance with **Section 5.4** as well as trained according to **Section 5.5**. Exposure to members of the public will be minimized through the implementation of security procedures found in **Section 5.6**. Routine and upset condition monitoring described in **Section 5.7** will be implemented to ensure exposures to employees and members of the public are ALARA and to identify any trends which may be an indication of an inoperable safety feature.

4.2 Liquid Wastes

The Project will generate several different types of liquid wastes, including three classified as 11(e)(2) byproduct materials by NRC. The different types of liquid wastes the Project will generate are:

- "native" groundwater generated during well development, sample collection, and pump testing;
- storm water runoff;
- waste petroleum products and chemicals;
- domestic sewage; and
- the three 11(e)(2) byproduct materials:
    - liquid process wastes, including laboratory chemicals,
    - "affected" groundwater generated during well development, and
    - groundwater generated during aquifer restoration.

Appropriate storage, treatment, and disposal methods for these wastes differ, as outlined below.

4.2.1 "Native" Groundwater Recovered during Well Development, Sample Collection, and Pump Testing

Groundwater is recovered during well installation, sample collection, and pump testing conducted prior to mining or from portions of the Permit Area not affected by mining. This "native" groundwater has not been exposed to any mining process or chemicals. During well development, sample collection, and pump testing, this water will be discharged to the surface under the provisions of a general Wyoming Pollutant Discharge Elimination System (WYPDES) permit, in a manner that mitigates erosion, or reused in the drilling process.

During lixiviant injection in a mine unit and prior to completion of mine unit restoration, liquid 11(e)(2) byproduct or source material that may be generated from activities such as well completion and development will be carefully collected in a manner that minimizes direct employee contact. For example, when completing or developing a well that contains NRC regulated material, the water will be directed to a lined pit or directly to a water tank to prevent soil contamination. The water will be collected and disposed of in the facility's licensed waste water system.

The RSO shall develop an SOP for these activities to ensure that the dose to employees is minimized by time, distance and shielding as appropriate. Potentially affected employees will be trained in the SOP. The RSO shall also, upon initiation of operations, perform an analysis to determine the potential dose from the source material based on actual radionuclide chemistry. The results of the analysis will be used to write the SOP in an ALARA manner. Since these solutions will be contained in pits, tanks and piping conveyances, the external radiologic consequence to employees and members of the public will be less than that generated by the solution spill scenario contemplated in Section 4.2.3 of NUREG/CR-6733 which is characterized as having "no significant external radiological consequences". As long as the solutions are contained, the only pathway for exposure would be external.

4.2.2 Storm Water Runoff

Procedural and engineering controls will be implemented such that storm water runoff from the area of the Plant will not pose a potential source of pollution. Per the requirements of the WYPDES, the applicable permits for runoff control during construction and operation of the Plant will be obtained from the Water Quality Division (WQD) of WDEQ.

4.2.3 Waste Petroleum Products and Chemicals

These wastes will be typical for ISR facilities, and will include items such as waste oil and out-of-date reagents, none of which will have been closely associated with the processing of 11(e)(2) byproduct materials. Any of these wastes that are non-hazardous will be stored in appropriate containers, prior to disposal by a contracted waste disposal operator, at an approved off-site waste disposal facility, such as the Carbon County Landfill.

Waste petroleum products will be clearly labeled and stored in sealed containers above ground in accordance with the requirements of the Occupational Safety and Health Administration (OSHA) and EPA. These wastes will be periodically collected by a commercial business for recycling or energy recovery purposes. LC ISR, LLC will generate about 40 to 80 gallons of waste petroleum products per year, and will be a Conditionally Exempt Small Quantity Generator of hazardous wastes, per EPA definition.

Waste chemicals not closely associated with the processing of 11(e)(2) byproduct material will be clearly labeled and stored in sealed containers above ground in accordance with the requirements of OSHA and EPA. These wastes will be periodically collected by a commercial business for recycling or disposal in a licensed disposal facility. An estimated five to ten gallons of waste chemicals will be disposed of per year.

4.2.4 Domestic Liquid Waste

Domestic liquid wastes will be disposed of in an approved septic system that meets the requirements of WDEQ-WQD. A permit will be obtained for the septic system prior to construction of the system. The septic system will receive waste from restrooms, shower facilities, and miscellaneous sinks located within the office. In addition, chemical toilets may be temporarily placed in mine units and other drilling areas. An estimated 500 to 700 gallons of domestic liquid waste will be disposed of daily; and the septic system and chemical toilets will be maintained by a licensed contractor.

4.2.5 Liquid 11(e)(2) Byproduct Material

The three 11(e)(2) byproduct materials:

- liquid process wastes, including laboratory chemicals;
- "affected" groundwater generated during well development and sample collection; and
- groundwater generated during aquifer restoration,

will be treated and disposed of on-site through a system of Storage Ponds and UIC Class I wells, as described below. Procedures to prevent and remediate accidental releases will also be in place, as described below.

4.2.5.1 Liquid Process Wastes

The ore processing produces three wastes, a production bleed, and eluant bleed, and yellowcake wash water. In addition, the laboratory analyses for evaluating uranium content of the production fluid and similar operational parameters will generate waste. These wastes will be collected, treated and the waste discharged to the Storage Ponds and UIC Class I wells (**Section 4.2.5.4**). The expected chemical and radiological composition of the liquid waste stream to be disposed of in the deep wells is provided in **Table 4.2-1**.

4.2.5.2 "Affected" Groundwater Generated during Well Development and Sample Collection

It may be necessary to develop (or redevelop) wells and collect samples of groundwater that has been affected by the mining operation to the extent that surface discharge of the water is not appropriate. During well development and sample collection, this water will be collected and treated; and the waste will be discharged to the Storage Ponds and UIC Class I wells.

4.2.5.3 Groundwater Generated during Aquifer Restoration

During the various steps of aquifer restoration (**Section 6.2**), groundwater will be generated; and disposal of some or all of the water will be required. During sweep, groundwater will be pumped from the production zone, creating an area of drawdown. This will create an influx of water from outside the production zone that will "sweep" the affected mining zone. In most cases, the water produced during sweep will be processed for residual uranium content through the ion exchange circuit, and then disposed directly

to the UIC Class I wells. In some cases, the groundwater pumped from the production zone may be treated by RO to reduce the waste volume; and the treated water (permeate) may be used in Plant processes or for makeup water in other restoration activities. To maintain the area of drawdown, the permeate will not be reinjected into the production zone, but will be transferred to other mine units for use as makeup water or injected into the UIC Class I wells. The concentrated byproduct material (brine) will also be injected into the UIC Class I wells.

During RO, groundwater will be pumped from the production zone. The pumped water will be treated by RO; and the permeate will be injected back into the production zone. To maintain an area of drawdown, an effective bleed will occur by adding additional permeate from other RO activities or by adding clean water to the permeate at a rate less than the produced rate. The brine from the RO treatment will be injected into the UIC Class I wells. Similarly, during other restoration steps, the amount of groundwater pumped from the aquifer will exceed the amount pumped back to the aquifer; and that excess water will be disposed of in the UIC Class I wells.

4.2.5.4 Disposal of Liquid 11(e)(2) Byproduct Materials

The liquid 11(e)(2) byproduct materials generated during the Project will be managed by deep well injection in conjunction with Storage Ponds.

Storage Ponds

Two 155-feet by 260-feet Storage Ponds will be constructed at the site in accordance with NRC and Wyoming State Engineer's Office (WSEO) standards and equipped with leak detection systems. The primary purpose of the ponds is to allow for shut down of the UIC Class I wells for maintenance (such as MITs) or repair while the Plant remains in operation. The total pond capacity will be designed to accommodate two weeks of Plant operation, which would generate 60 gpm of liquid at peak operating capacity.

A Professional Engineer with many years of experience designing ponds completed the design of the two storage ponds including the selection of polypropylene as the pond liner material. The chemical compatibility of polypropylene was checked against several published chemical compatibility charts including the Cole-Parmer charts found online at http://www.coleparmer.com/techinfo/ChemComp.asp. The water contained in the storage ponds will be mostly ground water with minor quantities of salts including sodium chloride, bicarbonate and sodium chloride. The compatibility charts show that polypropylene has excellent compatibility with sodium bicarbonate, sodium carbonate, sodium chloride, and brines saturated in sodium chloride. In rare instances permeate from the reverse osmosis system may be sent to the storage ponds. Permeate is similar in

content to de-ionized or distilled water of which both have excellent compatibility with polypropylene. If an upset condition were to occur in the plant it would also be possible for the polypropylene to be exposed to dilute solutions of caustic, hydrogen peroxide, and hydrochloric acid. The compatibility chart shows that the polypropylene liner has excellent compatibility with 50% caustic, good compatibility with 50% hydrogen peroxide, and fair compatibility with 37% hydrochloric acid. A fair rating means that the materials are not suitable for continuous use. The concentrations reviewed reflect the maximum concentration of the chemicals that will be used at the plant. If any of these chemicals were spilled in the plant, the concentration would be diluted with wash down water, water in the waste water tank, and the water in the storage ponds. There are no credible scenarios that could result in undiluted hydrochloric acid remaining in contact with the pond liner for an extended period of time.

A permit from the State Engineer is required prior to construction of the ponds. Maps and plans will be submitted with the application including detailed cross sections of the embankment, liner and leak detection system. The proposed pond designs will comply with the WSEO Safety of Dams program.

The proposed ponds construction will require geotechnical borings to determine compaction and soil density specifications for the proposed ponds site. Upon completion of the geotechnical analysis, a final engineering design will be completed by a Wyoming Professional Engineer and submitted to the WSEO for construction approval. After receipt of approval, approximately 5,000 cubic yards of topsoil will be stripped and stockpiled followed by excavation and construction of the embankment. Road base will be deposited and compacted next as the pond base. The base will then be covered by an impermeable liner. A leak detection system consisting of 4-inch slotted pipe and sand will be installed next. The slotted pipe will be tied into a “dry” well (standpipe) at the perimeter of the ponds, which will be routinely monitored to determine if the liner is leaking. Another liner will be then placed over the leak detection layer and “keyed” in to the ground surrounding the embankments.

The maximum fluid depth is proposed to be four feet with three feet of freeboard. Two ponds will be constructed measuring 155 feet by 260 feet each. **Attachment 4.2-1** provides the specifications of the storage ponds. The purpose of two ponds is to allow for complete removal of fluid from one pond to the other in the event of a leaking liner.

In addition, four shallow monitor wells will be installed prior to operations (three of the four have already been installed and did not encounter groundwater above the first significant aquitard). These wells will be installed to the first shale below surface and checked prior to operation of the ponds to determine: a) if groundwater exists; and b) the pre-operational water quality of such groundwater. Once operations have begun, the wells will continue to be sampled as noted above on a quarterly basis. The analysis

criteria will be specific conductance, chloride, alkalinity, sodium, and sulphate. If a change is noted in either groundwater content or quality, the ponds will be investigated for damage to the liner. If a leak or damage to the liner is found, use of the damaged pond will be discontinued until repairs have been completed. Any affected water in the monitored zone will be removed and/or treated as necessary.

To help maintain the integrity of the ponds by reducing liner exposure to sun, wind, and freezing temperatures, water will be kept in the ponds at all times by diverting a portion of the water that would normally go to the UIC Class I wells. The exception would be during pond maintenance or repair, at which times the liquid would be piped directly to the UIC Class I wells.

Routine pond inspections and monitoring will be conducted as specified in **Section 5.3.2** of this report. The inspection reports and monitoring results will be maintained on-site and summarized in the Annual Report submitted to NRC and WDEQ-LQD. Any maintenance issues identified during an inspection will be addressed in a timely manner to reduce the chance for damage to the pond integrity or liquid release to the environment.

UIC Class I Wells

Two to five UIC Class I wells are planned in the Permit Area as the primary disposal method for the liquid 11(e)(2) byproduct materials. LC ISR, LLC is preparing the UIC Class I permit application for submittal to WDEQ-WQD, which has primacy in Wyoming for the UIC program. In addition to the liquid 11(e)(2) byproduct materials, other compatible liquid wastes (any liquids approved in the Class I UIC Permit) will be disposed of in the wells. The wells will be monitored in accordance with the requirements of the UIC permit; and an evaluation of the well performance will be included in the Annual Report submitted to NRC and WDEQ.

The number of disposal wells is directly related to the injectivity associated with each. The following maximum disposal requirements are necessary:

Restoration RO:	640 gpm x 25% =	160 gpm
Restoration GWS:	160 gpm x 25% =	40 gpm
Total Stage 1 RO:		200 gpm
		+
Production Bleed:	6,000 gpm x 1% =	60 gpm
Total Before Stage 2 RO:		260 gpm
Final RO:	260 gpm x 50% =	130gpm

A minimum of two disposal wells will be constructed regardless of injectivity to allow for routine testing and maintenance. The redundancy of the wells in conjunction with the storage capacity of the ponds at the Plant will allow for little or no effect on the Project if one of the wells' operating status is upset.

The disposal well injection system will typically be controlled by the Plant Operators. The transfer pump and the injection pump will be interlocked to insure that one cannot operate without the other. Pressure and flow rate will be measured and compared at each of the pumps. If there is a discrepancy outside allowable tolerances, the system will alarm the Operator and shut down. The transfer pump is planned to be located in the Plant building while the injection pump is planned for the wellhead building at the disposal well.

If all disposal capacity is lost (short or long term), all unnecessary operations will cease and reverse osmosis will be utilized where possible to minimize waste. All waste fluids will be stored in plant tanks (approximately 30,000 gallons) and the lined ponds will be utilized for storage (1.25 million gallons per pond). These systems will be utilized until repairs can be affected on the disposal wells.

Alternatives

There are no alternate plans for liquid effluent disposal at this time. Three potential alternatives not proposed are land application, evaporation ponds and NPDES discharge. The waste disposal well system adequately supports the liquid effluent needs of the Project and eliminates the needs for some type of surface discharge. Two to four deep disposal wells are planned for installation to support continued operations during maintenance and testing.

4.2.5.5 Prevention and Remediation of Accidental Releases

The significant criteria to reduce the potential for accidental releases are: appropriate engineering design, construction, and maintenance; development and implementation of SOPs, covering topics such as inspections, notification procedures, and response actions; and on-going employee training in those SOPs and general health and safety procedures.

Given the anticipated low concentration of radionuclides in injection and production fluids and the fact that spilled solutions are not likely to become airborne until they dry, it is unlikely that an employee will receive a significant radiation dose while responding to a spill. Section 4.2.3 of NUREG/CR-6733 presents a conservative calculation that supports this conclusion. However, to maintain ALARA, once operations commence and the radionuclide content of the mining solutions is known, the RSO shall perform an

analysis to determine if a credible scenario exists that could result in a significant dose to an employee or to a member of the public. For purposes of this determination, significant shall mean any dose greater than 10% of applicable regulatory limits. A spill response SOP will be in place before the initiation of operations, but the RSO will use the results of the analysis to ensure the SOP is adequate to ensure ALARA spill response. The RSO shall review the SOP at least annually to ensure continued accuracy and relevance. If a spill scenario is not described in an SOP, then an RWP must be written, pursuant to **Section 5.2** of this report, before remediation can begin.

Inspections play an important role in preventing and discovering leaks. **Sections 5.3.1** and **5.7.6.5** of this report address the inspection practices and frequencies. With regard to instrumentation used to detect leaks, see also **Sections 3.2**, **4.2.5.5** and **5.7.1.4** of this report.

The facilities which will require specific attention are outlined below.

Storage Ponds

It is possible that a storage pond could fail, either in a catastrophic fashion or as a result of a slow leak. In addition, a pond could overflow due to excess inflow from the Plant or excessive precipitation.

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. 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.

Pipelines, Fittings, Valves, and Tanks

The most common accidental release from ISR operations is from breaks, leaks, or separations in the piping that transfers mining fluids to and from the Plant and the mine units. Failures of fittings and valves at the wellheads, in the header houses, at tanks, and other junctions are also a common cause of accidental releases at ISR operations.

Pipelines will generally be buried at a depth of six feet below ground surface, minimizing the possibility of freezing in adverse weather and of being damaged by surface traffic. Pipelines will be a minimum of six feet below the lowest point of a road installation (typically the borrow ditch) to minimize affects of travel compaction on the piping. In general, piping to and from the Plant and the mine units and within the mine units will be constructed of HDPE with butt-welded joints or the equivalent.

All pipelines, associated fittings and valves, and any tanks that will be under pressure during operations will be pressure tested before use. Flow through the pipelines will be monitored and will be at a relatively low pressure. Pressurized tanks will also be monitored for performance within specified limits. Sensors wired to automatic alarms and pipeline shutoffs will be installed to detect significant changes in flow rates or pressures in the pipelines and tanks to help prevent significant releases.

Wells

Casing and coupling failures in wells, either at the surface or in the subsurface, may release production or injection fluid. Monitoring of well construction, pressures in the ISR system, and appropriate mine unit balancing, as well as routine MIT of injection wells, will help prevent casing and coupling failures. Down-hole casing repair (with follow-up MIT) is generally sufficient to correct the problem; but well abandonment and replacement and delineation drilling may be necessary to address more serious situations.

Buildings

The buildings of most concern with respect to accidental releases include the header houses, the Plant, and the pumphouse(s) for the UIC Class I wells. Header houses and the pumphouse(s) are not considered as potential sources of pollutants during normal operations, as there will be no liquids stored within them. However, in the event of a pipeline or pump failure in a header house or pumphouse, the impact of that failure will be reduced by sumps equipped with fluid detection sensors wired to automatic alarms and shutoffs. Similarly, the Plant will be constructed with concrete containment curbing and sumps to allow for containment and recovery of any releases within the Plant.

Spill Response and Remediation

In the event of a spill of mining or process solutions, LC ISR, LLC will recover as much of the fluid as possible using equipment designated for this purpose. SOPs will be established to provide ALARA methods for spill recovery. The RSO or HPT will be notified of the spill immediately so they can visit the site and perform an assessment of the radiologic risks. The assessment will include:

- A drawing of the affected area so the location can be identified at decommissioning;
- a determination of the amount of fluid spilled;
- a calculation or analysis to determine the concentration of radionuclides in the soil;
- a determination of the cause of the spill;
- a determination of safety precautions that need to be taken immediately, if any;
- a determination of the extent and timing of soil cleanup; and
- a determination as to whether or not reporting is required pursuant to 10 CFR 20.2202 and 20.2203 and 10 CFR 40.60. If reporting is necessary the RSO shall complete the report in the time frame designated in the applicable regulations.

The RSO or HPT may call upon the expertise of the area supervisor to assist with the assessment. The results of the assessment will be filed in a decommissioning file until the license is terminated.

At least once per year, the Manager of Environmental Health and Safety (EHS) and Regulatory Affairs will convene a Spill Committee to review the cause of recent spills. The Spill Committee will consist of at least three individuals with experience in operations. After reviewing the causes of recent spills, the Committee will send a report to mine management detailing reasonable recommendations on how to prevent and minimize future spills.

4.2.5.6 Activity Concentration Cleanup Criteria

Accident scenarios for ISR facilities are described in detail in NUREG/CR-6733 (NRC, 2001). Potential doses from such incidents are estimated based on the assumption that a spill would not be cleaned up immediately and would be allowed to dry (The term U_3O_8 has historically been used by both the industry and the NRC to refer to uranyl peroxide and various uranium oxides. Technically, U_3O_8 does not exist but the term is commonly used in marketing the end product. When LC ISR, LLC refers to U_3O_8, it is referring to uranyl peroxide in solution, slurry, or dried yellowcake. This usage of the term is consistent with the analysis performed in NUREG/CR-6733. A further review of other

portions of NUREG/CR-6733 reveals that the terms uranyl peroxide and U_3O_8 are used interchangeably.). In such a case, the most significant potential route of exposure to workers and members of the public would be limited to inhalation of airborne radioactive material. However, with regard to residual contamination remaining after spill cleanup is completed, the doses to workers would include direct radiation dose as well as inhalation of particulates. The dose to a member of the public with unrestricted access to and use of the impacted area could include a variety of pathways.

LC ISR, LLC will conduct operations, to include spill cleanup, in agreement with the ALARA principle and the "member of the public" and worker dose requirements of 10 CFR 20 and the "member of the public" requirements of 40 CFR 190.10. However, since access to spill locations will be restricted during the years of operation, only those exposure pathways consistent with the site access restrictions and existing land use will be used to meet these regulatory requirements.

LC ISR, LLC's direct radiation surveys and correlations to measured soil Ra-226 (R^2=0.88; **Figure 2.9-7**) and soil Ra-226 correlations to measured soil uranium (R^2=0.73; **Figure 2.9-8**) provide the basis for uranium and radium soil background concentrations characterized over the Lost Creek Permit Area. However, should spills occur, LC ISR, LLC will collect additional soil samples outside the spill margins to further characterize the soil radionuclide concentrations so that when combined with the radionuclide analysis of the spill content, accurate cleanup levels can be established to meet the decommissioning "Radium Benchmark Dose" of 10 CFR 40, Appendix A, Criterion 6. This will assure there will be no appreciable radionuclide migration off the spill location, and final decommissioning will be facilitated.

The following discussion illustrates how LC ISR, LLC will use RESRAD analysis to establish soil cleanup criteria, and presents proposed initial cleanup criteria.

Activity Concentration Cleanup Criteria for a Spill at the Lost Creek Permit Area

NUREG/CR-6733 (NRC, 2001) describes spill scenarios involving solid or liquid materials, including thickener failure and spill, pregnant lixiviant spill, and loaded resin spill.

NUREG/CR-6733 assumes no initial cleanup in its risk assessments for the spill scenarios and assumes the spill would be allowed to dry. LC ISR, LLC is committed to taking all necessary precautions to ensure that such spills do not occur. However, in the unlikely event of a spill of solids or liquids containing radioactive material, appropriate actions will be taken initially to remove spilled material and clean up the impacted areas to levels such that residual radiation doses to workers from the spill following initial cleanup would be less than 100 mrem per year (LC ISR, LLC perceives this as an initial

ALARA target for workers) and doses to members of the public, no greater than 25 mrem per year. Spill-impacted areas will be cleaned up to reduce doses to ALARA below these levels. Further cleanup of impacted areas, if necessary to meet criteria for unrestricted use, would be included in the final decontamination and decommissioning of the facility. LC ISR, LLC will use RESRAD as appropriate, using analysis results from cleanup samples to verify that the above goals have been met.

The following analyses assume that a spill inside the restricted area would impact workers during operations, and that a spill outside the restricted area could impact members of the public with unrestricted access to, and use of, the impacted area. Since the intent of these analyses is to develop criteria for residual contamination after spill cleanup, it does not need to address dose from the spill itself or resulting cleanup operations to workers (whose dose will be controlled under the in place, approved radiation protection and ALARA programs) or members of the public (who cannot have unrestricted access during licensed operations or who would not have access to affected unrestricted areas during cleanup). The initial LC ISR, LLC cleanup criteria discussed in the following paragraphs are summarized in **Table 4.2-2**.

Thickener Failure and Spill

NUREG/CR-6733 postulates a spill of 73,500 gallons of slurry containing 24,200 kg of U_3O_8. If such an incident were to occur, the cleanup criteria would be dependent on the potential dose from natural uranium. According to NUREG/CR-6733, the sole substantial radiological hazard would be inhalation of airborne particulate matter. However, based on a RESRAD analysis, the primary contributor to dose from natural uranium would be external exposure (ground) presumably from beta and gamma radiation from the immediate decay products of U-238 (Th-234 and Pa-234m).

Any portion of the spill inside a building or containment would be cleaned up immediately and would not have the opportunity to dry out and become airborne. Therefore, doses to workers would be limited to the initial cleanup phase. The criterion for immediate cleanup within a building or containment would be based on the presence of visible residues, i.e., any visible loose spill material would be removed. Liquids that are absorbed into surface material such as concrete would not present a significant inhalation hazard as the uranium would not become airborne. A spill outside the building with the potential to contaminate soils would also be cleaned up immediately before the material could dry sufficiently to become an airborne dust hazard.

Spills within the restricted area will be cleaned up to levels that are ALARA. At a minimum, the impacted areas will be cleaned up to levels that would limit the residual, post cleanup dose to a worker to less than 100 mrem per year. Based on a RESRAD analysis, a U-nat concentration in soil equal to100 pCi/g would result in an annual dose

of 2.5 mrem/year. Since the dose is proportional to the concentration of uranium in soil, a cleanup level of 4000 pCi/g would result in an annual dose to a worker spending all of his or her 2,000 hr working year in the spill area approximately equal to 100 mrem per year, 76% from direct external exposure, 14% from inhalation of particulate matter, and 10% from soil ingestion. The RESRAD default dust concentration (0.1 mg/m^3) was used in the analysis. However, an increase in the assumed dust concentration to 1 mg/m^3 (to allow for possible LC site wind and dust conditions) would decrease the estimated cleanup criterion to 1,800 pCi/g due to the increased dose from inhalation of airborne particulate matter. An appropriate cleanup standard for spills within the restricted area, based on protection of workers, including a reasonable safety factor, is 1,500 pCi/g U-nat. LC ISR, LLC proposes this as the initial cleanup criterion for a spill of this nature.

Based on a RESRAD analysis, the dose to a member of the public at 100 pCi/g U-nat would be approximately 8 mrem per year, approximately 60% from direct external exposure, 10% from inhalation of particulate matter, and 30% from ingestion of locally grown plants, meat, and milk, as well as ingestion of soil. The estimated U-nat concentration in soil resulting in a dose of 25 mrem per year would be approximately 300 pCi/g above soil background concentration. This analysis is very conservative because it includes food chain pathways even though it is unlikely that food would be raised in the impacted area. LC ISR, LLC proposes this as the initial cleanup criterion for a spill of this nature in an unrestricted area.

Pregnant Lixiviant and Loaded Resin Spills

In its risk analysis, NUREG/CR-6733 assumes the pregnant lixiviant and loaded resin contains Ra-226 at a concentration of 3.4E3 pCi/L and U-nat at a concentration of 1.7E5 pCi/L. The short-lived decay products of Rn-222 were assumed to be in equilibrium with the Ra-226. As with the thickener spill scenario, the impacted area would be cleaned up immediately. The criteria for cleanup were calculated assuming a maximum annual dose to a worker of 100 mrem per year and 25 mrem per year for a member of the public. The RESRAD analysis was performed assuming a nominal U-nat concentration of 100 pCi/g in soil and a Ra-226 concentration of 2 pCi/g in soil, the ratio of the nuclides specified in NUREG/CR-6733. The appropriate clean up criterion was determined by scaling the nominal concentration.

Based on the most conservative RESRAD analysis, assuming an air particulate concentration of 1 mg/m^3, (again allowing for possible LC site wind and dust conditions) the estimated annual dose to a worker at a U-nat concentration in soil of 100 pCi/g and a Ra-226 concentration of 2 pCi/g, was approximately 10 mrem/year. Therefore, the cleanup criterion for U-nat would be 1,000 pCi/g with 20 pCi/g Ra-226 above soil background levels. LC ISR, LLC proposes this as the initial cleanup criterion for a spill of this nature.

The RESRAD-estimated dose to a member of the public from residual contamination after a spill of pregnant lixiviant (loaded resin spills will only occur in restricted areas since LC ISR, LLC does not intend to ship loaded resin at this time. If, in the future, resin is shipped from or to the site, additional analysis will be performed), assuming a U-nat concentration of 100 pCi/g and a Ra-226 concentration of 2 pCi/g, was 20 mrem/year. Therefore, based on a dose limit of 25 mrem per year, the cleanup criterion for members of the public would be 120 pCi/g U-nat, 2.2 pCi/g Ra-226. LC ISR, LLC proposes this as the initial ALARA target cleanup criterion for a spill of this nature; however, following a spill of this nature, LC ISR, LLC will use RESRAD with appropriate current land use and actual spill concentrations of Ra-226 and U-nat to re-determine the appropriate and justifiable cleanup criterion. Regardless, the cleanup criterion will meet the decommissioning "Radium Benchmark" of 10 CFR 40, Appendix A, Criterion 6.

Yellowcake Spill

LC ISR, LLC will apply the same cleanup criterion for a yellowcake spill, as for the thickener spill since in both cases the only nuclide of concern is uranium (NUREG/CR-6733).

In all cases, LC ISR, LLC will clean spills up as soon as practicable and will restrict access to the impacted area until the cleanup criteria are met. The above calculations are based on the assumed concentration ratio of U-nat to Ra-226 in the plant radioactive materials. The criteria will be adjusted if site specific data show a different assumption should be used.

4.3 Solid Wastes

Solid wastes, some of which will be classified as NRC 11(e)(2) byproduct materials, will be produced during construction, operation, and reclamation activities of the Project. Appropriate storage, treatment, and disposal methods for these wastes differ, as outlined below.

4.3.1 Solid Non-11(e)(2) Byproduct Materials

The solid non-11(e)(2) byproduct materials will include: non-hazardous materials typical of office facilities, such as paper, wood products, plastic, steel, biodegradable items, and sewage sludge; and hazardous materials also typical of office and ISR facilities, such as waste petroleum products and used batteries. None of these materials are closely associated with ISR and ore processing.

Materials which can be decontaminated may include piping, valving, instrumentation, and various other types of equipment. Decontamination (where possible) will be accomplished by completing a preliminary radiological survey to determine the location and extent of the contamination and to identify any hazards. The preliminary review will be in the form of an alpha survey. The primary step will be to remove loose contamination from the object by use of high pressure washing. If required, secondary decontamination will consist of washing with a dilute acid or equivalent compatible solution. Upon completion of decontamination, a final alpha survey will be performed to insure that the unrestricted release limits noted below are met:

- Removable alpha contamination of 1,000 disintegrations per minute (dpm)/100 square cm.
- Average total alpha contamination of 5,000 dpm/100 square cm over an area no greater than one square meter.
- Maximum total alpha contamination of 15,000 dpm/100 square cm over an area no greater than 100 square cm.

Equipment which cannot be decontaminated to these standards will be either used on site or sent to an NRC-licensed facility for disposal. Those materials meeting the above decontamination standard will be released unrestricted and shipped to the nearest public landfill (Carbon County Landfill).

The non-hazardous materials, with the exception of sewage sludge, will be recycled when possible or temporarily stored in commercial bins prior to disposal by a contracted waste disposal operator at an approved off-site solid waste disposal facility, such as the Carbon County Landfill. An estimated 500 to 700 cubic yards of non-11(e)(2) byproduct materials will be generated annually. An estimated three to five cubic yards of sewage sludge will be disposed of annually off-site at an approved facility by a licensed contractor.

Hazardous wastes will be clearly labeled and stored in sealed containers above ground in accordance with the requirements of OSHA and EPA. These wastes will be periodically collected by a commercial business for recycling or energy recovery purposes. LC ISR, LLC will be a Conditionally Exempt Small Quantity Generator of hazardous wastes, per EPA definition, generating about ten to 20 pounds of batteries and similar items per year.

4.3.2 Solid 11(e)(2) Byproduct Materials

The solid 11(e)(2) byproduct materials will include process wastes, such as spent ion exchange resin, filter media, and tank sludge, generated during ISR and ore processing,

and will include equipment that becomes contaminated during ISR and ore processing. These items include tanks, vessels, PPE, and process pipe and equipment. Such wastes could also include soils contaminated from spills.

Where possible, equipment will be decontaminated for disposal as non-11(e)(2) material or for re-use. Equipment that cannot be decontaminated and process wastes will be placed in clearly labeled, covered containers and temporarily stored in restricted areas with clearly visible radioactive warning signs. The solid 11(e)(2) byproduct materials will then be disposed of at an NRC-licensed facility, typically a uranium mill tailings impoundment, by personnel qualified to dispose of radioactive wastes. An estimated 80 to 100 cubic yards of solid 11(e)(2) byproduct material will be generated annually exclusive of final reclamation material. LC ISR, LLC is in the process of negotiating a written contract with an NRC-licensed facility for disposal of this material.

LC ISR, LLC commits to developing a disposal agreement with a facility licensed by the NRC or an Agreement State to accept 11(e)(2) materials. In the event such an agreement is terminated, LC ISR, LLC will notify NRC within seven days and will submit a new agreement for NRC approval within 90 days of expiration or termination.