

Technical Report – Request for Additional Information

Uranium One Americas
SUA-1341 License Amendment
Ludeman Project
Converse County, Wyoming

List of Acronyms

ALARA	as low as is reasonably achievable
CD	computer disk
CFR	Code of Federal Regulations
cfs	cubic feet per second
DDW	deep disposal well
ER	Environmental Report, SUA-1341 License Amendment for the Ludeman Project
ft	feet
GCC	Glenrock Coal Company
gpm	gallons per minute
GS	ground surface
ISR	in situ recovery
JFD	joint frequency distribution
km	kilometer
LLD	lower limit of detection
Lpm	liters per minute
LRA	License Renewal Application for SAU-1341
m	meter
m ³ /s	cubic meters per second
MIT	mechanical integrity test
mi	mile
mg/l	milligrams per liter
msl	mean sea level
NRC	U.S. Nuclear Regulatory Commission
pCi/l	pico Curies per liter
QA	quality assurance
RAI	request for additional information
ROI	radius of influence
RPP	Radiation Protection Program
RSO	Radiation Safety Officer
SCS	Soil Conservation Service
SER	Safety Evaluation Report
SERP	Safety and Environmental Review Panel
SRP	NUREG 1569, Standard review Plan for In Situ leach uranium Extraction License Applications (June, 2003)
TEDE	Total Effective Dose Equivalent
TOC	top of casing
TR	Technical Report, SUA-1341 License Amendment for the Ludeman Project
USGS	U.S. Geological Survey
WDEQ	Wyoming Department of Environmental Quality
WSEO	Wyoming State Engineers Office

Section 1 – Proposed Activities

RAI 1

Description of Deficiency

The organizational structure provided in the TR appears to be inconsistent throughout the document.

Basis for Request

Section 1 of the TR states: “Uranium One USA Inc. (Uranium One) is submitting this Technical Report (TR) to the ...”

Section 1.3 of the TR states: “This License Application which includes the TR and ER have been prepared and submitted by Uranium One Americas, Inc., a Nevada corporation.” The header on every page of the TR and ER says Uranium One Americas.

Section 5.1, Figure 5-1 is titled, “Uranium One USA, Inc. Organizational Chart”

The licensee for SUA-1341 is Uranium One USA Inc. The Ludeman license amendment to SUA-1341 was not submitted by Uranium One USA, Inc. License amendments must be submitted by the licensee identified on the license.

Formulation of RAI

Uranium One should revise Sections 1 and 5 of the TR, and all other applicable sections of the TR, to provide a consistent management structure for the Ludeman facility.

Section 2 – Site Characterization

RAI 2

Description of Deficiency

The TR does not identify the restricted areas for the Ludeman Project.

Basis for Request

Section 2.1.3 (3) of the SRP identifies this topic as a component of the staff’s review. Staff has reviewed the application and has not been able to identify the restricted areas for the Ludeman Project. It is possible that this may be described elsewhere in the document, but staff has not identified a general discussion of this topic in Section 2.1. Uranium One has briefly discussed fencing satellite facilities, but it is not clear to the staff if the satellite facilities are considered restricted areas. Additionally, it is not clear to the staff if well fields are considered restricted areas.

Formulation of RAI

Identify the restricted areas in Section 2 of the TR, or direct the staff to where it can be found in the document.

RAI 3

Description of Deficiency

The information provided in the TR is not consistent with the acceptance criteria in SRP Section 2.5.3.

Basis for Request

The information provided is not consistent with SRP Section 2.5.3 acceptance criterion (1), which states that the on-site meteorology program should be designed in accordance with Regulatory Guide 3.63, "Onsite Meteorological Measurement Program for Uranium Recovery Facilities—Data Acquisition and Reporting" (NRC, 1988). The regulatory guide states that meteorological measurement instruments should be physically located on or near the site that are capable of measuring meteorological information representative of the site vicinity and licensed operations. The location of the meteorological instruments should represent as closely as possible the long-term meteorological characteristics of the area. The base of the instrument tower should be sited at approximately the same elevation as the facility operation, and in an area where natural or fabricated obstructions (e.g., trees, buildings) will have little or no influence on meteorological measurements.

Section 2.5.1 of the TR states that the combination of the Douglas Airport and GCC sites will be substituted as the nearest representative data sets for the site specific analysis because these two sites exhibit terrain similar to the project area and are located in the same region. Further, the TR states that Douglas Airport is 15 mi southeast of the Ludeman site, and the GCC meteorological station is 14 mi from the center of the proposed Ludeman project area. TR Section 2.5.3.3 also indicates that the GCC site is a few hundred feet higher in elevation than the proposed Ludeman Project area. The staff's examination of TR Figure 2.5-1 indicates there are several miles between the proposed Ludeman licensed area and the GCC's meteorological station. The staff's examination of the site on a topography map (e.g., Google Earth®) indicates that obstructions, such as higher elevation features, occur between the GCC and the proposed licensed area.

Additionally, Uranium One states in TR Section 2.5.3.3 that because the proposed Ludeman Project will not be processing and drying uranium that airborne release of uranium particulates that could adversely affect on and off-site air quality will not be a factor during the proposed Ludeman operations. However, Uranium One states in TR Sections 5.7.1.1.1 and 7.3 that MILDOS-Area was used to model the dose from facility operations resulting from releases of radon gas and plans to use this model to estimate the radon gas released to the environment, which will be reported in the Semiannual Radiological Effluent and Environmental Monitoring Reports in compliance with 10 CFR Part 40.65. Meteorological data are fundamental parameters used in calculations by MILDOS, and therefore must be representative of the site.

Formulation of RAI

Provide on-site meteorological data as recommended in Regulatory Guide 3.63 or provide sufficient justification for the use of non site specific data.

- a. Rationale for using substitute data instead of on-site data must include a description of the topography and verification that there are no obstructions to affect meteorological conditions.
- b. The justification provided in TR Section 2.5.3.3 that the proposed Ludeman facilities will not be processing and drying of uranium is not a sufficient justification for not collecting on site meteorological data.

RAI 4

Description of Deficiency

The information provided in the TR is not consistent with the information needs described in Regulatory Guide 3.63.

Basis for Request

Regulatory Guide 3.63, Section C.1, states, that quarterly and annual wind direction, wind speed, and atmospheric stability data should be compiled in joint frequency and joint relative frequency (i.e., decimal frequency) form for heights representative of effluent releases and those stability categories should be established to conform as closely as possible to those of Pasquill. Uranium One followed the format suggested in the regulatory guide to report the seasonal and annual JFD for each stability class in TR Figures 2.5-15 through 17, and provided the JFD by stability class for GCC in TR Table 2.5-5. Although Uranium One states in TR Section 2.5.3.2 that 70 percent of all winds at GCC fall into stability class D, Uranium One did not report the relative frequency of each stability class. Uranium One should report results summarizing the relative frequency of each stability class that represents the 100 percent of the annual data collected (e.g., Class A 1%, Class B 10%, Class C 30%, etc.).

Formulation of RAI

Provide the relative frequency of each stability class for the Douglas Airport and GCC meteorological stations, and describe how these stability classes were determined.

RAI 5

Description of Deficiency

The information provided in the TR does not meet the information needs described in Regulatory Guide 3.63.

Basis for Request

Regulatory Guide 3.63, Section C.2 and 3, states where instruments should be located to collect various parameter measurements and the specifications for system accuracy. Uranium One did not provide this information for the Douglas Airport meteorological station. The accuracies of all systems should be appropriate to the use to be made of the information over the range of environmental conditions expected to occur during the lifetime of facility operation and should be consistent with the current state of the art for the measurement.

Formulation of RAI

Provide instrument details for the Douglas Airport meteorological station as was provided for the GCC meteorological station in TR Table 2.5-6.

RAI 6

Description of Deficiency

The information in TR Section 2.6.2, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in SRP Section 2.6.2 and acceptance criteria in SRP Section 2.6.3.

Basis for Request

As stated in SRP Section 2.6.3, the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

- (1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.
- (2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.

(3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map did not show the location of the Leuenberger Satellite wellfields or ore bodies. Based on staff's assessment, cross section, C-C', in Figure 2.6-5, appears to pass through the Leuenberger Satellite. This cross section extends from the far western boundary of the license area to the eastern boundary, spanning approximately eight miles. Only two wells logs, located 597.7 m (1902 ft) apart in Section 14, were used to define the Leuenberger site subsurface geology. These two logs indicate that mineralization is located in the 80 and 90 sands.

Formulation of RAI

The staff is unable to evaluate the site geology of the Leuenberger Satellite site based on the information provided in the application. Uranium One only provided two well logs on one cross section to describe the site geology for the entire satellite. Staff is aware that prior cross sections and exploratory borings exist for the Leuenberger site as it was previously licensed as a pilot in late 1970s. Uranium One has also provided well boring maps that show numerous borings were made to assess resources in the Leuenberger Satellite. The staff therefore requests the Uranium One provide local geological cross sections based on several well logs through the principal axes of the Leuenberger Satellite's three ore body locations in the three proposed wellfields. These cross sections should at a minimum show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly labeled. The potentiometric water levels of aquifers if available and any other information which can inform the local site geology of the Leuenberger Satellite should be included.

RAI 7

Description of Deficiency

The information in TR Section 2.6.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 indicates that the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

- (1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.
- (2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.
- (3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map did not show the location of the North Platte Satellite wellfields or ore bodies. Based on staff's assessment, cross section, C-C', in Figure 2.6-5, which extends from the far western boundary

of the license area to the eastern boundary, spanning approximately seven miles, appears to have four well logs that may pass through one North Platte ore body located in Sections 15 and 16. Another cross section, N-N' in Figure 2.6-16, passes north to south across the license area. Four well logs on this cross section are located in Section 15 and may pass through the proposed North Platte ore body location. Both cross sections C-C' and N-N' indicate the ore is located in the 70 sand which may be composed of three distinct layers. There appears to be little to no underlying confining layer separating the underlying 60 sand from the 70 sand on either cross section. In addition, the overlying 80 sand is discontinuous above the 70 sand where the ore lies. The distance between well logs on both cross sections ranged from 1000-3500 ft, which does not provide the resolution necessary for staff to assess confining layers or continuity of any formation of interest.

Cross section, I-I', in Figure 2.6-11 appeared to pass north to south through the North Platte satellite southern ore body located in Section 20. Three well logs in Section 20, located 800-1950 ft apart indicated the presence of ore in two separate 70 sands. Once again the overlying 80 sand appeared discontinuous and the underlying 60 sand did not appear to have a significant confining layer between it and the 70 sand ore zone.

Formulation of RAI

The staff is unable to evaluate the site geology of the North Platte Satellite based on the information provided in the application. Uranium One provided only a small portion of two large cross sections to describe the site geology at one ore body and a small portion of only one large cross section to describe the geology for the other ore body. Staff is aware that the North Platte site was previously assessed by Uranium Resources, Inc. as a potential uranium recovery site in the early 1980s. Therefore exploratory well logs should exist to create detailed local geological cross sections. Uranium One has also provided well boring maps that show numerous borings were made to assess resources in the North Platte Satellite. The staff therefore requests that Uranium One provide local geological cross sections based on several well logs through the principal axes of the North Platte Satellite's two ore body locations at the proposed wellfield locations. These cross sections should at a minimum show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly defined and labeled. The potentiometric water levels of aquifers if available and any other information which can inform the local site geology of the North Platte Satellite should be included.

RAI 8

Description of Deficiency

The information in TR Section 2.6.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

In accordance with SRP Section 2.6.3, the characterization of the site geology will be acceptable in the application if it includes a description of the local stratigraphy with:

- (1)(d)(ii) Cross sections through the ore deposit roughly perpendicular and parallel to the principal ore trend.
- (2) All maps and cross sections are at sufficient scale and resolution to clearly show the intended geologic information.

(3) In the local stratigraphic section, all mineralized horizons, confining, and other important units such as drinking water aquifers are clearly shown with their depths from the surface clearly indicated.

Uranium One provided geological cross sections for the entire license area. A geological cross section index map was provided in Figure 2.6-2 of the TR. The cross section index map does not show the location of the Peterson Satellite wellfields or the ore bodies. Based on staff's assessment, a small portion of cross sections, E-E', in Figure 2.6-4, and cross section, J-J', in Figure 2.6-12, appear to pass through the ore body in Section 28. Two well bores, located 2700 ft apart on J-J' indicated the presence of ore in a sand identified as the 80 sand. On cross section E-E', three well borings located 1200-2500 ft apart indicated the presence of ore in the 80 sand.

For the ore body located in Sections 34, 35 and 36, four cross sections appeared to intersect the ore body; F-F' in Figure 2.6-8, L-L' in Figure 2.6-14, N-N' in Figure 2.6-16, and M-M' in Figure 2.6-17. Cross section F-F' runs west to east and contains five well logs spaced at distances of 1800 to 2500 ft, which indicate the presence of ore in the two separate sands identified as the 90 sand. The top of the 90 sand in the west is located approximately 100 ft below ground surface. In the east, the top of the 90 sand is near the surface and outcrops above the flood plain of Sage Creek. Ore is located very near to the outcrop. The underlying and overlying sands appear to be separated by very thin confining layers. The information provided in the north to-south cross sections agree with the interpretation in the F-F' cross section.

Formulation of RAI

The staff is unable to evaluate the site geology of the Peterson Satellite based on the cross sections provided in the application. Uranium One has provided well boring maps that show numerous borings were made to assess resources in the Peterson Satellite. The staff therefore requests that Uranium One provide local geological cross sections based on several well logs through the principal axes of the Peterson Satellite two ore body locations at the proposed wellfield locations. These cross sections should, at a minimum, show the subsurface geology from the ground surface through the mineralized horizons to be targeted for extraction to the first aquifer below the mineralized horizons. Confining layers and aquifers should be clearly defined and labeled. The potentiometric water levels of aquifers if available, and any other information which can inform the local site geology of the Peterson Satellite, should be included.

RAI 9

Description of Deficiency

The information provided in TR Section 2.6.4, Drill Holes, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 states that the staff can find the characterization of the geology acceptable if: *“plugging and abandonment records are provided from State, Federal, and local sources, as appropriate, and that the applicant should provide evidence that action has been undertaken to properly plug and abandon all wells that cannot be documented in this manner.”*

Uranium One reported in TR Section 2.6.4 that the proposed Ludeman license area had been extensively explored for uranium by several companies from the 1970s to the 1990s. It stated approximately 4574 rotary drill holes and 66 core holes were completed. Drill holes were reported to be plugged in accordance with Wyoming Statute WS 35-11-404 in effect at the time. Uranium One did not indicate it had made any efforts to verify the location or condition of any of these boreholes.

Formulation of RAI

The NRC staff cannot ascertain if Uranium One has undertaken an effort to identify the abandoned drill holes within the area of the proposed wellfields and ensure that all are appropriately abandoned. The staff also has received no commitment that Uranium One will plug any abandoned drill holes which are located and found not to be properly sealed. Finally staff has no commitment from Uranium One that they will commit to plug any abandoned drill holes which are located as a consequence of a suspicious water level/pressure response on pumping tests or if leakage is identified during operations. The staff requests that Uranium One provide a commitment to re-enter, plug, and abandon any improperly plugged boreholes it discovers by pumping tests or other methods.

RAI 10

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.6.2 and acceptance criteria in Section 2.6.3 of the SRP.

Basis for Request

SRP Section 2.6.3 (5), states that all significant mineral and energy related deposits and associated infrastructure within and near the proposed license area should be identified.

Uranium One reported no other subsurface mineral exploration or production within the license area at the same horizon as the proposed project. In their review, staff has determined that there is significant existing and proposed oil and gas activity within and near the license area.

Formulation of RAI

Uranium One reported in Appendix A-1 on page A-7, which was revised in December 2011, that there were no oil/gas exploration or development activities in or near the proposed license area. The staff has determined that, based on the August 2012 site visit and a search of the Wyoming Oil and Gas Conservation Commission database, there are several active oil and gas permits and wells, in and near the license area (see Table below). The application should be revised to include:

- A listing of all permitted and existing oil/gas wells in the table and any others not noted within the license area or within two km of a wellfield, including their completion depth and operating status;
- a map of the locations of these permitted and existing oil/gas wells showing the length of any horizontal wells in the subsurface;
- an analysis of the potential impacts arising from the proximity of geological formation(s) in which the permitted or existing oil/gas wells are completed to the geological formation(s) targeted for the proposed satellite deep disposal wells; and

- a commitment to identify any change in permitted or existing oil/gas wells within the proposed license area, or within two km of a wellfield, and their potential impact on DDW operations for the life of the facility.

Well/Permit Name	Location	Owner	Depth /Formation	Date of Permit/ Completion
API- 49-009-28566	T34N R74W Section 11	Chesapeake Operating Inc	12,921 ft Niobrara	11/18/11
API-49-009-28403	T34NR74W Section 24	Chesapeake Operating Inc	12,622 ft Niobrara	7/29/2011
API-49-009-28414	T34NR73W Section 16	Chesapeake Operating Inc	12,262 ft Niobrara	4/12/2011
API-49-009-28353	T34NR73W Section 4	Chesapeake Operating Inc	12,524 ft Niobrara	5/26/2011
API-49-009-28354	T34NR73W Section 14	Chesapeake Operating Inc	12,166 ft Niobrara	11/16/2011
API-49-009-28474	T34NR72W Section 19	Chesapeake Operating Inc		
API-49-009-22889	T34 NR73W Section 11	General Atlantic	10,225 ft	10/21/94

RAI 11

Description of Deficiency

The information in TR Section 2.7.1, Surface Water Hydrology, does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified six sub-watersheds within the project area and buffer: (1) Little Box Elder, (2) Sand Creek, (3) North Platte River, (4) Little Sand Creek, (5) Sage Creek and (6) Running Dutchman Ditch. The text on page 2.7-2, says nine watersheds, when only six are identified.

Formulation of RAI

Please correct this discrepancy.

RAI 12

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified eight smaller drainages within the sub-watersheds in the license area which are shown in Figure 2.7.2 of the TR. The location of the satellites and wellfields were not shown on this figure.

Staff was not able to assess the locations of the proposed wellfields relative to the eight smaller drainages to have reasonable assurance that the drainage channels would not impact the safety of operations.

Formulation of RAI

Provide maps showing the location of all proposed satellite wellfields relative to the eight smaller drainages.

RAI 13

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One was unable to measure the flow of any of the eight smaller drainage channels as a consequence of their ephemeral nature. However, it provided estimates of peak flows for the all of the drainages within the license area which are reproduced in the table below. The two methods used produced an order of magnitude difference in the peak flow estimates.

Watershed	Area (mi²)	SCS 25-year (cfs)	SCS 50-year (cfs)	SCS 100-year (cfs)	USGS 25-year (cfs)	USGS 50-year (cfs)	USGS 100-year (cfs)
SAGE-10	3.75	164	224	292	1315	1927	2680
SAGE-11	1.96	167	243	320	1258	1815	2482
SAGE-12	3.33	235	323	432	1252	1832	2546
SAGE-13	2.34	205	282	372	842	1244	1743
SAGE-20	2.22	183	253	334	823	1216	1704
SAND -10	0.8	111	155	207	692	1002	1375

SAND-20	5.16	380	518	691	1169	1738	2453
RD-10	3.33	335	468	613	1569	2271	3121

(Source: Uranium One Americas, 2011, adapted from Table 2.7-5 in the TR)

Staff was unable to determine which estimates were the most suitable to assess the magnitude of the peak flows in the eight smaller drainages to provide reasonable assurance that they would not impact the safety of satellite operations.

Formulation of RAI

Uranium One should provide a discussion of which peak flow estimates should be used at each proposed satellite. Uranium One should evaluate the velocity associated with each peak flow, so staff can assess the potential for wellfield infrastructure damage.

RAI 14

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One identified several surface water impoundments within the license area. Approximately 195 individual water bodies were identified ranging from 28 ft² to 5.1 acres. The larger ponds were described as drainages which had been impounded for livestock. Some of these stock ponds were supplied by windmills. The two largest ponds were identified as Gilbert Lake in the eastern portion of the license area which was 16 acres and 6 inches deep when surveyed in 2008. Another depression pond was located in the northern portion of the license area and was 4.8 acres and 12 in deep.

Uranium One did not appear to provide a listing of any surface water rights associated with drainages or impoundments within the license area. However, staff found this information in Addendum 2.7-A mingled with the groundwater rights. Uranium One did not provide a map showing the surface water rights in the license area.

Formulation of RAI

Uranium One should provide the surface water rights in a separate addendum from groundwater rights for a 2 mi buffer around the license area. In addition, NRC requests that Uranium One provide a map(s) identifying the surface water rights within 2 km of the proposed wellfields and surge ponds separately for the Leuenberger, North Platte and Peterson Satellites.

RAI 15

Description of Deficiency

The information provided in TR Section 2.7.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The FEMA 100 year flood zone maps showed inundation of a dammed pond on the main channel within the RD-10 drainage which crosses Peterson Wellfield 1. Uranium One did not address this flooding or its potential impact to wellfield infrastructure at the proposed Peterson Wellfield 1. Staff cannot provide reasonable assurance of the safety of the operation of Peterson Wellfield 1 without this information.

Formulation of RAI

Uranium One should discuss how the infrastructure for this proposed wellfield will be impacted by this potential flooding and any mitigation measures they intend to use to prevent or alleviate these impacts.

RAI 16

Description of Deficiency

The information provided in TR Section 2.7.3.1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff's review of the surface water sampling results identified two locations where measurements appeared to show anomalous values for cations, anions, and radionuclides. The two locations of concern are SW-1 and SW-29 located down-stream of the Leuenberger Satellite on Little Sand Creek. SW-1 is located just west of the Leuenberger Satellite and SW-29 is located further downstream from the satellite. As shown in the RAI 17 Surface Water Quality table SW-1 and SW-29 showed anomalously high average values for bicarbonate, chloride, conductivity, sulfate, calcium, sodium, magnesium, uranium and gross alpha. The values of these constituents at SW-24 on Little Sand Creek directly up-gradient of the Leuenberger Satellite were below the license area average.

Uranium One did not address the surface water quality anomalies at SW-1 and SW-29. Staff does not have reasonable assurance that Uranium One has characterized surface water quality at Little Sand Creek.

Formulation of RAI

Uranium One should evaluate the source of anomalous surface water quality at SW-1 and SW-29 at Little Sand Creek.

RAI 17

Description of Deficiency

The information provided in TR Section 2.7.3 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Two other surface water sampling locations within the license area demonstrated anomalous values for cations and anions but not radionuclides with respect to the average surface water quality reported for the license area. These sites were SW-6 located northwest of the North Platte Satellite, and SW-16 located east of the North Platte Satellite. The average values measured for SW-16 are shown in the following Surface Water Quality table. Staff is not aware of any uranium recovery operations in these locations or other sources for the anomalous values. Staff does not have reasonable assurance that the surface water quality has been reasonably characterized as these anomalies were not addressed by Uranium One.

Surface Water Quality

Constituent	Average SW	SW-24 Average (Upgradient)	SW-1 Average (Downgradient)	SW-29 Average (Downgradient)	SW-16
HCO₃ (mg/l)	126.07	94.4	358.2	529	301.2
Chloride (mg/l)	10.82	1.6	58.8	47	121.8
COND (umhos/cm)	866.7	192.8	3144.0	3350	5874
TDS (mg/l)	720.2	155	2516.0	2760	4928
Sulfate (mg/l)	390.2	30.4	1556.6	1665	3050
Ca (mg/l)	57.9	24.2	249.4	316	243
Mg(mg/l)	32.9	8.2	149.6	179	195.4
Na (mg/l)	112	6.6	289.6	262	1047.0
U (mg/L)	.02	.00058	0.2127	0.159	0.02
Gross Alpha (pCi/l)	38.9	8.52	416	193	15.5

Formulation of RAI

Uranium One should address if there is any source(s) which may be responsible for the anomalous surface water quality values at SW-6 and SW-16 (e.g., oil production water spills, agriculture). If a source exists, provide a strategy which may be used to distinguish future contamination from spills, leaks or excursions from nearby satellite facilities.

RAI 18

Description of Deficiency

The information provided in TR Section 2.7.3 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium one did not evaluate if any seasonal trends were observed in the surface water quality data. Staff does not have reasonable assurance that the surface water quality has been characterized.

Formulation of RAI

Uranium One should provide an assessment of any temporal or seasonal variation in surface water quality based on surface water quality measurements.

General License Area Groundwater Hydrology

RAI 19

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff evaluated the Addendum 2.7-C table “Summary of Monitoring Well Completions” and found the majority of the well top of casing (TOC) elevations in the tables were in conflict with well log ground surface elevations of the same wells provided in the cross sections in Figures 2.6-3 through 2.6-13. The table below presents the monitoring well top of casing elevations provided Addendum 2.7-C vs. the elevations provided on the cross sections. As can be seen in the table, there are often very large differences in the elevations. These differences call into question the aquifer water levels in mean sea level which were calculated based on the top of casing elevation. These water elevations are the basis for the potentiometric surfaces created for all the aquifers in the proposed license area. In addition, the selection of aquifer sand location is questionable if the well TOC elevation is inaccurate. Because of these errors, staff was unable to evaluate the potentiometric surfaces, ground water flow direction and magnitude for the Leuenberger, North Platte or Peterson Satellites. Staff is also unsure if Uranium One has made the appropriate identification for the location of the underlying sands and aquitards based on the elevation errors. Staff cannot evaluate or provide reasonable assurance for the safety of operations at any of the proposed satellites without correction of the elevations of these monitoring wells and all figures and calculations (e.g. sand top and thickness) which were based on them.

Monitoring Well Elevations

MW Name	Sand/Satellite within 2 km	Top Of Casing (ft msl) Table Add. 2.7-C-3	Ground Surface Elevation (ft msl, cross section noted)	Difference (ft) (TOC-GS)
M-2	90/NA	5280	5332 (A-A')	-52
M-3	90/NA	5300	5290 (A-A')	+10

M-4	90/NA	5285	5280 (A-A')	+5
M-5	80/NA	5200	5198 (A-A')	+2
M-6	100/NA	5240	5349 (B-B')	-9
M-7	110/L	5290	5358 (C-C')	-68
M-8	80/L	5235	5257 (C-C')	-22
M-10	70/NP	5220	5176 (J-J')	+44
M-15	70/NP	5180	5078 (D-D')	+102
M-16	70/NP	5050	5063 (D-D')	-13
M-17	80/NP	5060	4997 (D-D')	+63
M-19	80/P	5035	5032 (J-J')	+3
M-21	70/P	5065	5068 (E-E')	-3
M-23	70	5040	5040 (D-D')	0
M-24	90/P	4980	4988 (F-F')	8
M-26	80/NA	5310	5389 (B-B')	-8
LPW-1	80/L	5194	5217 (C-C')	-23

Note: L-Leuenerger, NP-North Platte, and P-Peterson

Formulation of RAI

Uranium One should correct all monitoring well elevations noted to be in error on the table and correct all discussions, tables, maps, cross sections and isopachs which used the incorrect elevation information from these monitoring wells. In addition, Uranium One should ensure that all well surface elevations presented in the application are accurate and all calculations based on them are also accurate. Staff is especially concerned about the correction of the elevation of the overlying aquifer sand, ore zone aquifer sand, underlying aquifer sand and associated aquitards at each satellite. Additionally, staff is very concerned about the potentiometric surfaces and vertical gradients between aquifers which were calculated based on these elevations. Staff notes that anomalous potentiometric surface mounds were associated with some of these elevation errors. Therefore, once corrections are made to the elevations, provide the corrected potentiometric surfaces and estimate the ground water flow magnitude and direction for all overlying aquifers, ore zone aquifers and underlying aquifers for the Leuenerger, North Platte, and Peterson Satellites. Uranium One should use available water levels from wells located within 2 km of the each satellite's proposed wellfields for these updated surfaces, not just the limited monitoring wells available to provide better estimates of ground water flow direction and magnitude.

RAI 20

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

During a site visit in August 2102, staff observed an occupied ranch with a house and several outbuildings to the east of the Leuenerger Satellite. Staff did not find a discussion of this residence and the private water wells or surface water rights associated with it in the application. Staff was not able to determine if any other such residences exist within the license

area. Staff cannot evaluate the safety of the use of any private wells or surface water rights at this ranch or any other residences in the license area.

Formulation of RAI

Uranium One should clearly identify on a map and describe all residences and all of the private wells and surface water rights associated with each residence within the proposed license area.

RAI 21

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

No information was provided on LMP-5 in Addendum 2.7-C, "Summary of Monitoring Well Completion". The JS well on the table was not identified on maps. The completion information on OW-1 and OW-9 was not consistent throughout the application in several tables and discussions. The location of OW-9 was not shown on all maps.

Formulation of RAI

Uranium One should correct all tables and maps which include these wells and correct any discussions of these wells in the text.

Leuenberger Satellite Ground Water Hydrology

RAI 22

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The proposed Leuenberger Satellite is located in T34N, R74W in the far northwestern corner of the proposed license area. Three wellfields are proposed for the satellite. Uranium One stated that the target ore zones of interest are the 90 or 80 sands of the Ft. Union formation. However, Uranium One did not indicate whether one or both of the sands would be targeted in any of the three designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the exact sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should separately identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1, 2 and 3 at the Leuenberger Satellite. Uranium One should be aware that these ore sands will be the sands in which extraction can occur under this license at the Leuenberger Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI 23

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

In the 1980 Teton mining application for the Leuenberger site, the 100 and 110 overlying aquifer sands were identified as the O sand. The 1980 potentiometric surface for the O sand prepared by Teton was defined by water levels from several wells with good spatial coverage and showed that the groundwater flow direction was to the southwest. Teton indicated the groundwater surface in the O sand followed the topography, and O sand groundwater discharged to the Little Sand Creek drainage to the west of the facility. Uranium One provided a potentiometric surface for the same overlying aquifer in the 110 and 100 sands, defined by only two wells, which now show the flow is toward the east and north, respectively. This change in potentiometric surface would represent essentially a reversal of ground water flow direction in the overlying 100 and 110 sand aquifers. Uranium One did not present the historical potentiometric information for the O sand even though it referenced historical data from the Leuenberger pilot project in many other parts of the application. Staff cannot evaluate the safety of the operations at Leuenberger Satellite without an evaluation of this change in groundwater flow direction in the overlying 100 and 110 sand aquifers.

Formulation of RAI

Uranium One should evaluate the potentiometric surface in the 110 and 100 sands at the Leuenberger Satellite and determine if the groundwater flow direction in these aquifers has significantly changed direction since the evaluation in 1980 for the Teton Leuenberger ISR application. If the flow direction has changed, please provide an explanation (e.g., pumping drawdown from the Negley Subdivision wells which staff has determined were mostly installed after 1979).

RAI 24

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed Leuenberger Satellite. Characterization is critical to assess if spills and leaks from proposed surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. Staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should characterize the surficial (uppermost) aquifer(s) at the Leuenberger Satellite. Provide a map of the depth to the uppermost aquifer(s) at the Leuenberger Satellite within a 2 km buffer around Wellfields 1, 2 and 3 and the proposed surge ponds. Uranium One should discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages, particularly Little Sand Creek, at the Leuenberger Satellite.

RAI 25

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the 80 sand aquifer test at LPW-1, Uranium One provided the water level vs. time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-1 through 6-8 of Appendix A-2. For the 90 sand aquifer test at LPW-2, Uranium One provided the water level vs. time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-9 through 6-16 of Appendix A-2. Uranium One provided electronic files of the water level data for the test on CD for the 80 sand but not the 90 sand. The plots are useful for a quick check of the well response to pumping; however, the plots were insufficient for NRC staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes. Uranium One also provided a Cooper Jacob analysis of the recovery data of only one observation well for each test in Appendix A-4. Uranium One did not provide an analysis of the recovery data from the pumping well or the other observation wells for either test. The staff finds the 2008 80 sand multi-well tests indicate a higher transmissivity than the original Teton tests. The 2008 80 sand multi-well tests did not indicate the leakage seen on the Teton 80 and 90 sand tests. The staff finds the 2008 test did not demonstrate the boundary effects that were noted in the original Teton 80 and 90 sand tests. Staff finds that the information provided for the 80 sand aquifer test at LPW-1 and 90 sand aquifer test at LPW-2 is not sufficient to assess the hydrologic characteristics of these aquifers.

Formulation of RAI

Uranium One should provide traditional time drawdown curves on semi-log time scale for all observation wells for both the 80 and 90 sands aquifer tests at the Leuenberger Satellite. Uranium One should also provide recovery curves on semi-log time scale for the pumping well and the observation wells. Please analyze all curves for transmissivity and storage coefficient and provide these values. If any boundary effects or leakage are noted, describe and reassess the hydrogeologic characteristics of the 80 sand and 90 sands at the Leuenberger Satellite. Provide the water level data for the 90 sand pumping test in electronic form.

RAI 26

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

During the 80 sand aquifer test, the 70 sand underlying aquifer monitoring well, LMU-1, showed a steady increase in water level which continued through the 90 sand test and several months later. Uranium One stated this increase was due to an incomplete seal between the casing and the well bore allowing flow presumably from an overlying aquifer to the 70 sand. The TR does not indicate that Uranium One had plugged the well to prevent this transfer.

Uranium One did not determine if the 70 sand well might be demonstrating recovery that is related to the interference of a nearby pumping well in the 70 sand (e.g. State deep water well 7-16). NRC staff cannot assess the behavior of the underlying 70 sand based on the information provided.

Formulation of RAI

Uranium One should provide assurance that this well has been properly abandoned to prevent leakage, and a discussion of other potential causes for this response and any implications for operations.

RAI 27

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The Leuenberger Satellite has three proposed wellfields. Wellfields 1 and 3 are located in Section 14 of T34NR74W (Figure 2.7-11). Wellfield 2 crosses both Sections 13 and 14 of T34NR74W. Addendum 2.7-A-1 provides the existing ground water rights for all private wells within a 2 mile buffer of the license area. However, the locations of these wells are not provided on a map at the scale of the Leuenberger Satellite demonstrating the proximity to the proposed wellfields.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed Leuenberger wellfields and add the coordinates of these wells to the table in Addendum 2.7-A.

RAI 28

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Staff reviewed the Addendum 2-7A table for private wells (other than Negley Subdivision) within 2 km of the Leuenberger wellfields which included wells in Sections 9, 10, 11, 12, 13, 14, 15, 16, 22, 23, 24, 25, and 26. Within the table, staff identified 4 private wells in Section 9, one private well in Section 10, one private well in Section 12, one private well in Section 13, one private well in Section 14, 2 private wells in Section 15, and no private wells in Sections 22, 23 and 24. These wells are listed in the following table. Staff has no information on which aquifer(s) these wells are completed in and their current use. Staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Table: Leuenberger Satellite Private Wells (excluding Negley Subdivision)

Permit Number	Location	Name/Date	Owner	Specified use	Screen/Depth	Permit Rate
P174491.0W	T34NR74W S9SE1/4 SE 1/4, 1/4	Woeck 2 2/24/2006	Peter Woeck	Irrigation	?	1600 gpm
P8171.0P	T34NR74W S9NW1/4 SW 1/4, 1/4	Henry Keenan 1 3/31/1940	Peter and Kathy Woeck	Domestic, Stock	?/100 ft	5 gpm
P8172.0P	T34NR74W S9NE1/4 SE 1/4, 1/4	Henry 2 4/30/1953	Henry Keenan	Domestic, Stock	?/60 ft	5 gpm
P8173.0P	T34NR74W S9NE1/4 SE 1/4, 1/4	Henry Keenan 3 4/30/1920	Henry Keenan	Domestic, Stock	?/41 ft	3 gpm
P70764W	T34NR74W S10NW1/4 SW 1/4, 1/4	Keenan 4 7/31/1985	Joe R. Keenan	Domestic	92- 114ft	25 gpm
P4987P	T34NR74W S12SE1/4 NE 1/4, 1/4	Smith 4	Smith Sheep Company	Stock	?/150 ft	10 gpm
P9823W	T34NR74W S13 SW1/4 SE 1/4, 1/4	Smith 45 deepened October 20, 2009	Smith Sheep Company	Stock	160- 180 ft	7 gpm
P78113W	T34NR74W S14 NW1/4 NE 1/4, 1/4	PN5 L314 9/26/1988	William J. Smith	Stock, Misc	535- 604 ft	20 gpm
P4988	T34NR74W S14 SW1/4 NW 1/4, 1/4	Smith #5 12/31/45	Smith Sheep Company	Stock	?/145 ft	10 gpm
41/2/72W	T34NR74W S15 SE1/4 NW 1/4, 1/4	Benevides 1 5/5/2008	Peter Benevides	Domestic, Stock	?	?
P27740P	T34NR74W S15 SE1/4 NW 1/4, 1/4	Hildebrand 1 8/22/74	Hildebrand , Inc**	Domestic, Stock	?/20 ft	7.5 gpm
P27741P	T34NR74W S15 SE1/4 NW 1/4, 1/4	Hildebrand 2 8/22/74	Hildebrand , Inc**	Stock	?/20 ft	17.5 gpm
41/9/228W	T34NR74W S15 SE1/4 NW 1/4, 1/4	State Deep Water Well 7-16	North Finn, LLC, WY Board of Land Com.	Industrial	?/545 ft	40 gpm

The staff also searched the WSEO water rights database to verify the completeness of wells provided in the Addendum 2-7 A table and identify any additional wells completed within 2 km of

the Leuenberger proposed wellfields. The area reviewed within the 2 km included all of Sections 10, 11, 12,13,14,15, 22, 23, and 24. This search uncovered four new wells which had been permitted or installed within the 2 km buffer but were not listed by Uranium One and one well which had a different location description which placed it one mile closer to the wellfields. These wells are listed in the following table. One well, identified as Hart 1 had been installed and 2 wells, Brody 1 and Wesston 1 received permits in the Negley Subdivision. Staff is concerned about the Brody 1 and Wesston 1 wells as their approved depth may be in the 90 or 80 sands. Additionally a miscellaneous/drilling water well, South Hylton, had been permitted for Section 24. This well may be located in the 80 sand and its approved rate could be sufficient to impact hydraulic control of any 80 sand ore zone extraction. Staff has no information on the current status of these wells. Therefore, staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Table : Additional Leuenberger Satellite Private Wells (including Negley Subdivision)

Permit Number	Location	Name/Date	Owner	Specified use	Screen/D epth	Permit Rate
P197937.0 W	T34NR74W S11SE1/4 NW ¼,1/4	Brody 1 May 7, 2012	Ross Allen	Domestic well (Negley Subdivision)	280-300 ft/?	25 gpm
P197937.0 W	T34NR74W S11SE1/4 NW ¼,1/4	Wesston 1 April 26, 2012	Ross Allen	Domestic well (Negley Subdivision)	280-300 ft/?	25 gpm
P191727.0 W	T34NR74W S11 SW1/4 SE ¼,1/4	Hart 1 October 20, 2009	Virgil Hart	Domestic well (Negley Subdivision)	?/110 ft	20 gpm
P195723.0 W	T34NR74W S 24 NW1/4 NE1/4,1/4	South Hylton Ranch 34- 74 24 1 H WW	Chesapeake Operating	Misc: Drilling and Fracking Water	550-650 ft/?	150 gpm
P55423.0W	T34NR74W S24 SE1/4 NW ¼,1/4	Pacific Power and Light 4 April 13, 1981	L. Joe Whiting	Check location- WSEO permit has this location (S24) per remarks on no. 14 on completion report	160-200 ft/?	25 gpm

Formulation of RAI

Uranium One should provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables and indicate if any of these wells are completed in the 80 or 90 sand or any targeted ore zone aquifers and overlying/underlying aquifers at the North Platte Sattelite. Uranium One should discuss if operation of those wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations. Uranium

One should also provide a commitment to annually update information on private well use and describe any new private wells installed within 2 km of the Leuenberger Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

North Platte Satellite Groundwater Hydrology

RAI 29

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The proposed North Platte Satellite is located in the eastern and central portion of the proposed license area in T34N, R73W. Two wellfields are proposed: Wellfield 1 is located south of the satellite facility in Sections 15 and 16; and Wellfield 2 is located further southeast of the satellite facility in Section 20. Uranium One stated that the target ore zone of interest is the 70 sand of the Ft. Union formation, but did not indicate whether this sand or other sands would be targeted for extraction in either of the two designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the exact sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1 and 2 at the North Platte Satellite. Uranium one should be aware that these ore sands will be the sands in which extraction can occur under this license at the North Platte Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI 30

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed North Platte Satellite. Characterization is critical to assess if spills and leaks from surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. Staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should identify the surficial (uppermost) aquifer(s) under the North Platte Satellite. Provide a map of the depth to the uppermost aquifer(s) at the North Platte Satellite within a 2 km buffer around Wellfields 1 and 2 and the proposed surge ponds. In addition, the TR should

discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages, at the North Platte Satellite.

RAI 31

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the 70 sand aquifer test at LPW-3a, Uranium One provided the water level vs time curves for the pumping well and all of the observation wells for the pumping and recovery periods in Figure 6-17 through 6-21 of Appendix A-2. Uranium One also provided the aquifer test data in electronic form on CD. These plots are useful for a quick check of the well response to pumping and atmospheric conditions; however, the plots were insufficient for the staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes. Uranium One also provided a Cooper Jacob analysis of the recovery data of one observation well, LMP-5 in Appendix A-4. The residual drawdown of greater than one at $t/t' = 1$ and value of $S/S' = 0.57$ value for this analysis is outside the range considered acceptable for the assumptions inherent to this analysis and may be indicative of a limited aquifer (Driscoll, 1986). The TR did not address this issue. Staff finds that the information provided for the 70 sand aquifer test at LPW-3a is not sufficient to assess the hydrologic characteristics of these aquifers.

Formulation of RAI

Uranium One should provide traditional time drawdown curves on semi-log time scale for all observation wells for the 70 sand aquifer test at North Platte Satellite. Provide recovery curves on semi-log time scale for the pumping well and the observation wells. In addition, analyze all curves for transmissivity and storage coefficient and provide these values. If any boundary effects or leakage are noted, describe and reassess the hydrogeologic characteristics of the 70 sand at the North Platte Satellite.

RAI 32

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

For the LPW-3a 70 sand aquifer test, overlying well LMO-2a was located in the 100 sand according to TR Addendum 2.7C. The isopach for the North Platte site shows the 80 sand is the overlying aquifer to the 70 sand in this location in Wellfield 1. The overlying well should have been located in the 80 sand, or if missing, the 90 sand, to evaluate the integrity of the overlying shale to the 70 sand ore zone. Uranium One noted that this occurred and stated it was due to a re-evaluation of the screen interval at LMO-2a after the test. The staff cannot conclude that the ore zone is isolated from the overlying aquifer to assure the safety of the operation in the 70 sand.

Formulation of RAI

Uranium One should provide additional evidence, than the pumping test at LPW-3a, that the overlying shale to the 70 sand is sufficient to preclude fluid movement to the overlying aquifers at the North Platte Satellite.

RAI 33

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The North Platte Satellite has two proposed wellfields. Wellfield 1 is located in Section 20 of T34NR73W (Figure 2.7-11), and Wellfield 2 crosses both Sections 15 and 16 of T34NR73W (Figure 2.7-11). Uranium One provided the existing ground water rights for all private wells within a 2 mile buffer of the license area in addendum 2.7-A-1, but did not provide the coordinates of these wells and a map of the North Platte Satellite demonstrating the proximity of these wells to the proposed wellfields.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed North Platte wellfields, and add the coordinates of these wells to the table in Addendum 2.7-A.

RAI 34

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The staff reviewed the Addendum 2-7A for private wells within 2 km of the North Platte wellfields. For Wellfield 1, this includes wells in Sections 8, 9, 10, 11,13,14,15, 16, 17, 21, 22 and 23. For Wellfield 2, this includes wells in Sections 16, 17, 18, 19, 20, 21, 28, 29, and 30. From the table, staff identified two private wells in Section 9, two in Section 15, and one each in Sections 17, 19, 30 and 35. These wells are listed in the following table. The TR provides no information on which aquifer(s) these wells are completed in and their current use. Therefore staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Table: North Platte Satellite Private Wells

Permit Number	Location	Name/Date	Owner	Specified use	Screen/Depth	Permit Rate
P179808W	T34NR73W S9NE1/4 SE ¼,1/4	WW- 347309-1 2/21/2007	Energy Metals	Misc.	?	25 gpm
P180989W	T34NR73W 35SE1/4 SE ¼,1/4	2081 WW 1/31/2007	Energy Metals	Misc.	?	25 gpm

P22299P	T34NR73W S9NE1/4 SE ¼, 1/4	Moore 9- 34-73 12/31/1947	Eddie Moore	Stock	?/ 260 ft	5 gpm
P60274W	T34NR73W S15 NE1/4 NW¼, 1/4	Water well 1 4/7/82	Uranium Resources	Misc.	200-250 ft/?	5 gpm
P69576W	T34NR73W S15NW1/4 NE ¼, 1/4	URI North Platte Pilot Well#1 10/1/84	Uranium Resources	Misc.	520-570 ft/?	20 gpm
P14294W	T34NR73W S17NW1/4 SE ¼, 1/4	Spring Pasture Well 1 6/15/72	Edward D. Moore	Stock	216-246, 251-288 ft/?	4 gpm
P4567W	T34NR73W S30 SW1/4 SE ¼, 1/4	Smith 39 2/13/70	Smith Sheep Company	Stock	240-265 ft/?	10 gpm
P8612.0W	T34NR73W S19 NW1/4 NW ¼, 1/4	Smith 43 4/9/71	Smith Sheep Company	Stock	?	10 gpm

The staff also searched the WSEO water rights database to verify the wells provided in the Addendum 2-7 A table and identify any additional wells completed within 2 km of the North Platte proposed wellfields. This search uncovered one new well which had been permitted or installed within the 2 km buffer but was not listed in Addendum 2-7 A. This well was a miscellaneous/drilling water well, Gilbert Ditch Unit 34-73 16-1H WW that had been permitted in Section 16. This well may be located in the 70 sand or another targeted ore zone sand and its approved rate could be sufficient to impact hydraulic control of the wellfields. The staff has no information on the current status of these wells. Therefore, the staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Table: Additional North Platte Satellite Private Wells

Permit Number	Location	Name/Date	Owner	Specified Use	Depth	Permit Rate
P197937.0W	T34NR73W S16SE1/4 SE ¼, 1/4	Gilbert Ditch Unit 34-73 16-1H WW 12/6/2010	Chesapeake Operating	Misc/Drilling water well	?	150gpm

Formulation of RAI

Uranium One should provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables, and indicate if any of these wells are completed in the 70 sand or any targeted ore zone aquifers and overlying/underlying aquifers at the North Platte Satellite. Uranium One should discuss if operation of these wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations. Uranium One should also provide a commitment to annually update information on private well use and

describe any new private wells installed within 2 km of the North Platte Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

Peterson Satellite Site Groundwater Hydrology

RAI 35

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP (NRC, 2003a).

Basis for Request

Two wellfields are proposed for the Peterson Satellite which is located in the southeastern portion of the proposed license area. Wellfield 1 is located in Sections 27 and 28 of T34N, R73W west of the satellite facility. Wellfield 2 is located in Sections 34, 35, 36 of T34N, R73W south of the satellite facility. Uranium One stated that the target ore zone of interest is the 90 sand of the Ft. Union formation; however, Uranium One did not indicate whether this sand or other sands would be targeted for extraction in either of the two designated wellfields. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without specification of the sands to be targeted for extraction at each wellfield.

Formulation of RAI

Uranium One should separately identify the overlying aquifer, aquitard, ore zone aquifer, underlying aquitard and underlying aquifers specifically targeted at Wellfields 1 and 2 at the Peterson Satellite. Uranium One should be aware that these ore sands will be the sands in which extraction can occur under this license at the Peterson Satellite. Any extraction in additional wellfields/ore sands will require a license amendment.

RAI 36

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One did not characterize the surficial (uppermost) aquifer at the proposed Peterson Satellite. Characterization is critical to assess if spills and leaks from surface operations and subsurface piping will contaminate the uppermost aquifer which may be connected to surface water. The staff cannot evaluate or provide reasonable assurance of the safety of operations without characterization of the surficial (uppermost) aquifer.

Formulation of RAI

Uranium One should identify the surficial (uppermost) aquifer(s) at the Peterson Satellite, and provide a map of the depth to the uppermost aquifer(s) within a 2 km buffer around Wellfields 1 and 2 and the proposed surge ponds. The TR should discuss any hydraulic connection between the uppermost aquifer(s) with surface water features and the drainages at the Peterson Satellite.

RAI 37

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR includes an analysis of historical and recent pumping tests for the hydrogeological characterization of the Peterson Satellite ore zone aquifers and their potential connection to overlying and underlying aquifers. The TR states that Envirophere had conducted two 24 hr tests to evaluate the 90 and 80 sands in 1979. The TR indicates the results may be found in the report, "Hydrologic Analysis, Cell 1 and Cell 2", but does not provide the data or results from these tests. The location of the cells was shown in Figure 2.7-18. The staff is concerned that the 90 sand is unconfined at these locations. Staff cannot evaluate or provide reasonable assurance for the safety of operations at the Peterson Satellite without access to available historical information on behavior of the 90 sand aquifer.

Formulation of RAI

Uranium One should provide available information from the historic pumping tests conducted by Envirophere at the Peterson Satellite, including the report, "Hydrologic Analysis, Cell 1 and Cell 2."

RAI 38

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR stated the 90 sand aquifer is confined at the Peterson Satellite. The report also stated the 90 sand outcrops near the Peterson Satellite and has no overlying aquifer. The staff has determined that monitoring well M-24, which is located in the 90 sand in the eastern part of Wellfield 2, has a water level of 4932 ft according to the completion table in Table 3-1 in Appendix A-1. This water level is below the top of the 90 sand on the cross section F-F provided in Figure 2-14 in Appendix A-2 and is evidence that the 90 sand is unconfined in this location.

In addition, cross section N-N' in Figure 2-16 passes through LMU-3 which is in nearly the same location as the 90 sand pumping test observation wells, LMP6 and LMP7. The top of the 90 sand is at about 4950 feet at LMU-3 according to this cross section. The water levels for LMP6 and LMP7 are reported as 4971 and 4972 ft, respectively for these wells in Table 3-1 in Appendix A-1. These values place the aquifer water levels near the top of 90 sand. Therefore, under pumping the aquifer could reach an unconfined state in these locations. Staff cannot evaluate or provide reasonable assurance for the safety of operations at the Peterson Satellite without accurate characterization of the unconfined/confined conditions in the 90 sand aquifer.

Formulation of RAI

Uranium One should re-evaluate the water levels in all available monitoring wells in Peterson Wellfield 2 to determine if the 90 sand aquifer is unconfined. If the aquifer is found to be

unconfined, or likely to behave as an unconfined aquifer under expected pumping conditions (15-45 gpm per expected bleed), Uranium One should provide an updated interpretation of the hydrological characteristics of the aquifer. The updated interpretation should discuss the potential that the aquifer is unconfined on the eastern edge of Wellfield 2 and confined along the western edge and may exhibit dual behavior during pumping tests.

RAI 39

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR provides pumping test data and results from a 2008 pumping test conducted in the 90 sand in the Peterson Satellite. The pumping well, LPW-4 and observation wells, LMP-6 and LMP-7 for the 90 sand were located in proposed Wellfield 2 as shown on application Figure 2.7-22. Only one observation well was located in the underlying 80 sand next to the pumping well. The TR indicates there was no overlying monitoring well as there is no overlying aquifer in the location. Two ore zone aquifer observation wells, LMP-6 and LMP-7 were located in the 90 sand at 334 and 228 ft, respectively, from the pumping well. For the 90 sand aquifer test at LPW-4, the TR provides the water level vs time curves for the pumping wells and all of the observation wells for the pumping and recovery periods in Figures 6-22 through 6-25 of Appendix A-2. These plots are useful for a quick check of the well response to pumping and atmospheric conditions; however, the plots are insufficient for staff to evaluate the aquifer response as the time scale was oddly set as a log scale of the Julian date which repeated for several points instead of the usual log scale in minutes.

The TR provides a Cooper Jacob analysis of the recovery data of one observation well, LMP-7, in Appendix A-4. The value is substantially lower than the transmissivity reported in the 90 sand at the Leuenberger Satellite, 94.85 vs 18.11 ft²/day. The staff is concerned with the analysis and results of this aquifer test for several reasons. The recovery plot analysis of LMP-7 in Appendix A-4 shows a large t/t' at zero drawdown and an $S/S' = 1.34$. Both of these values are outside the range considered acceptable for the assumptions inherent to this analysis. These values are indicative of an aquifer with a varying storage coefficient which may indicate the aquifer is unconfined (Driscoll, 1986). The staff evaluated the recovery water level data provided by Uranium One for both the pumping well and the LMP-7 monitoring well. Staff's analysis indicates that the curves show evidence of the delayed yield expected in an unconfined aquifer in the recovery. Finally, the test was conducted at rate of 8.9 gpm, which is half the aquifer test rate at the other satellites. The staff is concerned that Uranium One used this lower rate to avoid drawdown which would dewater the 90 sand aquifer. The Staff finds the information provided is not sufficient to review the 90 sand aquifer test at LPW-4 at the Peterson Satellite. Staff cannot evaluate or provide reasonable assurance for the safety of operations at this satellite without an evaluation of unconfined aquifer behavior in the 90 sand at the Peterson Satellite.

Formulation of RAI

Uranium One should:

- provide traditional time drawdown curves on semi-log time scale for all observation wells;
- provide recovery curves on semi-log time scale for the pumping well and the observation wells;
- analyze all curves for unconfined aquifer behavior;
- provide transmissivity, specific yield and storage coefficient values from the analysis for all wells; and
- describe and reassess the hydrogeologic characteristics of the 90 sand at the Peterson Satellite, if unconfined behavior is demonstrated.

RAI 40

Description of Deficiency

The information provided in TR Addendum 2.7-A-1 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The Peterson Satellite has two proposed wellfields. Wellfield 1 crosses both Sections 27 and 28 of T34NR73W (Figure 2.7-11), and Wellfield 2 is located in Sections 34, 35 and 36 of T34NR73W (Figure 2.7-11). Addendum 2.7-A-1 provides the existing ground water rights for all private wells within a 2 mile buffer of the license area. However, Uranium One did not provide the coordinates of these wells and a map at the scale of within 2 km of the Peterson Satellite demonstrating the proximity of these wells to the proposed wellfields. Without a map and well coordinates, the staff is unable to evaluate any public safety concerns.

Formulation of RAI

Uranium One should provide a map at a scale which clearly shows the location of all private wells within 2 km of the proposed Peterson wellfields and provide the coordinates of these wells in Addendum 2.7-A.

RAI 41

Description of Deficiency

The information provided in TR Addendum 2-7A does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Addendum 2-7A identifies wells within 2 km of the Peterson Wellfields. For Wellfield 1 this includes wells in Sections 20, 21, 22, 23, 26, 27, 28, 29, 32, 33, and 34 of T34R73W. For Wellfield 2 this includes wells in Section 25 of T34R73W, Sections 30, and 31 of T34R72W, Sections 1, 2, 3, 4, 10, 11, and 12 of T33 R73, and Section 6 of T33R72. Staff identified numerous private wells within 2 km of the wellfields. These wells are listed in the following table. Addendum 2-7A provides no information on which aquifer(s) these wells are completed in and their current use. Therefore, staff cannot evaluate the safety of their use within 2 km of the proposed wellfields.

Peterson Satellite Private Wells

Permit			Owner			

Number	Location	Name/Date		Specified Use	Screen/Depth	Permit Rate
P180989W	T34NR73W 35SE1/4 SE 1/4,1/4	2081 WW 1/31/2007	Energy Metals	Misc		25 gpm
P71052.0W	T34NR73W S32 NW1/4 SE 1/4,1/4	Vollman Stock 9/6/85	Vollman Ranches	Stock		25 gpm
P77601.0W	T34NR73W S34 SW1/4 NE 1/4,1/4	Lisco #3 7/22/88	Carroll Lisco	Stock	?/340 ft	15 gpm
P71052.0W	T34NR73W S35 SW1/4 SE 1/4,1/4	OW1 7/7/88	Richard Lisco	Stock	?/175 ft	15 gpm
P71052.0W	T34NR73W S35 NE1/4 NW 1/4,1/4	OW9 7/7/88	Richard Lisco	Stock	?/340 ft	15 gpm
P75291.0W	T33NR73W S2 SE1/4 SE1/41/4	Lisco 2 8/11/87	Carroll Lisco	Domestic, Stock	15- 18 ft/ 20 ft	10 gpm
P126595W	T33NR73W S2 SW1/4 SE1/41/4	Lisco 5 6/27/2000	Carroll Lisco	Domestic, Stock	10-18 ft/ 30 ft	9 gpm
P22297P	T33NR73W S2 SW1/4 SE1/41/4	Moore 2- 33-73 12/31/68	Eddie Moore	Domestic	?/45 ft	6 gpm
P19404P	T33NR73W S3 NE1/4 SW1/41/4	Moore 10/31/46	Pacific Power and Light Co.	Domestic, Stock	?/80 ft	25 gpm
P150212W	T33NR73W S11 NW1/4 SE1/41/4	Thiel 1 4/22/03	Loren Thiel	Domestic, Stock	200-270 ft/ 280 ft	9 gpm
P25898W	T33NR73W S11 NE1/4 NW1/41/4	J Whiting 1 2/21/74	Jimmie D. Whiting	Domestic, Stock	10 -20 ft/ 22 ft	6 gpm
P8238.0P	T33NR73W S11 SE1/4 NW1/41/4	Whiting 1 2/28/46	Adolf O. Whiting	Domestic, Stock	?/18 ft	6 gpm
P8600.0P	T33NR73W S11 SE1/4 NW1/41/4	Whiting 2 12/31/39	Adolf O. Whiting	Stock	?/14 ft	6 gpm
P22298.0P	T33NR73W S12 NE1/4 SW1/41/4	Moore 12- 33-7 12/31/68	Eddie Moore	Stock	?/50 ft	4 gpm
P98857.0W	T33NR73W S12 NW1/4 SW1/41/4	Thompson 1 4/24/95	David and Lea Thompson	Domestic	337-350 ft/360 ft	15 gpm
40/3/500W	T34NR72W	West Reed	Smith	Stock	Unknown	Unknown

	S31 SW1/4 SE1/41/4	1/16/2008	Sheep Company			
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Formulation of RAI

Uranium One should; provide the status, target aquifer(s), current use and predicted use of the wells which are listed in the above tables, and determine if any of these wells are completed in the 90 sand or any targeted ore zone aquifers or underlying/overlying aquifers at Peterson Satellite. If yes, Uranium One should determine if operation of those wells could incur any safety issue for well owners or impact hydraulic control of the wellfields during operations.

Uranium One should provide a commitment to annually update information on private well use and describe any new private wells installed within 2 km of the Peterson Satellite proposed wellfields including their coordinates, completion, type of use and rate until the license is terminated.

RAI 42

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

On November 13, 2001, the Supreme Court of the United States issued the Modified North Platte River Decree which addressed water use from the North Platte River. In this decree, portions of the North Platte watershed are identified as hydrologically connected to the North Platte River. Within these regions surface water and ground water use for irrigation and other purposes is strictly controlled by a court order. Staff's review of the regional map (<https://sites.google.com/a/wyo.gov/seo/documents-data/maps-and-spatial-data>) for hydrologically connected areas near the North Platte River showed that the Peterson Satellite is located within the hydrologically connected region. Therefore all water use at this satellite, whether surface or ground water, must be approved by WSEO to meet the requirements of the decree. Any evaporation or surge ponds must also meet the terms of the decree. The TR does not include a discussion of the decree in its characterization of ground water or surface water or the implications for the safety of operations at the Peterson Satellite if water use is limited or restricted. Staff cannot provide reasonable assurance of the safety of operations without this information.

Formulation of RAI

Uranium One should provide:

- a description of the Modified North Platte River Decree and implications for water use at Peterson Satellite;
- assurance that the water use required for production and restoration at the Peterson Satellite will be evaluated and approved as required under these orders. This water use includes wells and all surge /evaporation ponds; and
- a commitment that if any changes to the wellfield design, ponds, or water use are incurred by the WSEO under this order before operations begin or during operations,

Uranium One must inform NRC, so that a safety evaluation of these modifications may be made.

RAI 43

Description of Deficiency

The information provided in TR Section 2.7.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

Uranium One took one measurement of ground water quality from a network of 12 stock wells within the proposed license area. The locations of the stock wells are shown in Figure 2.7-26. The TR states there is no completion information for the stock wells. Staff cannot assign the water quality of these wells to a specific aquifer without this information and therefore cannot evaluate the safety of the use of these stock wells within 2 km of the proposed wellfields without knowledge of their completion interval.

Formulation of RAI

Uranium One should:

- assess the depth and assign aquifer(s) to the twelve stock wells shown in Figure 2.7-26; and
- determine if any of the ground water rights within the license area are associated with these stock wells.

RAI 44

Description of Deficiency

The information provided in TR Section 2.7.3.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The water quality from stock well SW-12 shows anomalous values for cations, anions, and radionuclides compared to the averages for these wells. SW-12 is located in the Leuenberger Satellite as shown in Figure 2.7-26. Staff does not know the depth of SW-12. Another RAI addressed anomalous values in the surface water quality near this location in Little Sand Creek which may be hydraulically connected to the uppermost aquifer. Based on this information, staff cannot conclude that the water quality in the uppermost aquifer has been characterized.

Formulation of RAI

Uranium one should provide additional information on the water quality in the surficial (uppermost) aquifer at the Leuenberger Satellite.

RAI 45

Description of Deficiency

The information provided in TR Section 2.7.3.2 does not meet the applicable requirements of 10 CFR 40.41(c), using the review procedures in Section 2.7.2 and acceptance criteria in Section 2.7.3 of the SRP.

Basis for Request

The TR described the ground water quality monitoring for the aquifers in the proposed license area in Section 2.7.3.2. Ground water samples were collected quarterly from the majority of 41 monitoring wells within the license area sites in 2008. The locations of the monitoring wells were presented in Figure 2.7-25. The ground water quality in the license area showed spatial trends in the dominant ion types of water present, which varied with depth from the surface and distance from the sand outcrops in the southeastern part of the license area. Several of the aquifers are close to the ground surface, especially at the Peterson Satellite, where the 90 sand ore zone aquifer is also the uppermost aquifer. Given the proximity of many of the aquifers to the surface, the water quality may experience seasonal/temporal variation. Uranium One did not evaluate if any seasonal/temporal variation existed in the ground water quality data. Staff cannot conclude that there is no temporal variation without this analysis.

Formulation of RAI

Uranium One should provide an evaluation of any temporal variation the ground water quality in the aquifer(s) in the license area using the available water quality data from the monitoring wells. If any trends are seen, Uranium One should discuss them and any implications for operations or monitoring of water quality during operations.

RAI 46

Description of Deficiency

The information provided in the TR Section 2.9.4.1 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the on-site environmental monitoring program should be designed in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that at each location, several sediment samples should be collected in a traverse across the body of water and composited for analysis. Uranium One only collected a single sample at each surface water site according to the description in TR Section 2.9.4.1 and Figure 2.9-37.

Formulation of RAI

Provide justification or rationale for not collecting any sediment samples in a traverse across any bodies of water as recommended in Regulatory Guide 4.14.

RAI 47

Description of Deficiency

The information provided in TR Section 2.9.4.1 does not meet SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the monitoring programs to establish background radiological characteristics, including sampling frequency, sampling methods, and sampling location and density should be established in accordance with pre-operational monitoring guidance provided in Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that for sediments collected from surface water passing through the site, sediment should be sampled upstream and downstream of the site. Samples should be collected following spring runoff and in late summer, preferably following an extended period of low flow. In each location, several

sediment samples should be collected in a traverse across the body of water and composited for analysis.

It is not clear from the text in TR Section 2.9.4.1 that Uranium One followed the protocols described in Regulatory Guide 4.14.

Formulation of RAI

Uranium One should collect an additional set of samples up and downstream from the site in streams that flow through the site or identify which samples described in TR Section 2.9.4 are the upstream and downstream samples. The samples should be collected in a traverse across the body of water as recommended in Regulatory Guide 4.14.

RAI 48

Description of Deficiency

The information provided in the TR Section 2.9.4 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the applicant should design the on-site program in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). TR Section 2.9.4 is not consistent with information from other applicants reviewed by the staff. Uranium One states that differences in measured sediment radionuclide concentrations between the two seasons submitted in other applications have been observed to be similar within normal sampling and analytical variability. Uranium One references two of its previous license applications for Moore Ranch and the Antelope and JAB Uranium Projects, but did not provide the statistics to support its argument. The staff finds that other applicants collected single samples because there was insufficient rainfall or snowmelt to warrant a second sampling event or surface water was ephemeral and did not indicate variability in water levels. The streams remained dry between sampling periods in the same year and therefore, would not result in transport of radionuclides in surface water that would have been absorbed or precipitated into sediments. Uranium One's rationale that sediment sampling at other ISR sites in the region show that measured differences in sediment radionuclide concentrations between runoff season (spring) and low-flow (fall) hydrologic conditions are very similar, is not sufficient justification for not following the regulatory guidance nor is it consistent with information that the staff has reviewed. Additionally, site specific data is needed to comply with 10 CFR 40, Appendix A, Criterion 7.

Formulation of RAI

Uranium One should collect a second set of samples to comply with the guidance in Regulatory Guide 4.14 or provide the statistical data that supports its position that a second set of samples within the same calendar year are not warranted as recommended in Regulatory Guide 4.14

RAI 49

Description of Deficiency

The information provided in TR Section 2.9.11 is not consistent with SRP Section 2.9.3 acceptance criterion (1).

Basis for Request

SRP Section 2.9.3 acceptance criterion (1) states that the applicant should design the on-site program in accordance with Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring At Uranium Mills" (NRC, 1980). The regulatory guide states that the applicant should collect at least three food samples at time of harvest or slaughter or removal of animals from grazing within three km of the mill site, and that the applicant should collect fish samples semiannually from any bodies of water that may be affected by potentially contaminated areas. Section 2.9.11 of the TR states that no food sampling is planned because the applicant does not expect food to be in the exposure pathway to man. This justification is not acceptable and does not establish baseline conditions required by 10 CFR 40, Appendix A, Criterion 7 that requires the preoperational monitoring program establishing background concentrations in environmental media be conducted at least one-full year prior to any major site construction.

Formulation of RAI

Uranium One should provide fish and food samples as described in Regulatory Guide 4.14.

Section 3 – Description of Proposed Facility

RAI 50

Description of Deficiency

The information provided in TR Section 3.1 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.1 states that mineralization in the proposed license area is located in the 50, 60, 70, 80, 90 and 100 sands. TR Figure 3-1 shows numerous defined and potential roll fronts. Uranium One stated it will continue delineation in the license area to define future wellfield patterns. Uranium One has only proposed to extract uranium within certain wellfields and has been unclear about which mineral zones are targeted within those wellfields. Staff cannot provide reasonable assurance of the safety of operations without a clear definition of the specific mineralized zones targeted for extraction at each proposed satellite in this licensing action.

Formulation of RAI

Uranium One should provide a clear declaration of which ore zones will be targeted for extraction at each specific wellfield at the Leuenberger, North Platte and Peterson Satellites. Staff notes that new wellfields and operations in ore zones other than those specifically stated and reviewed for this application must be approved with a license amendment.

RAI 51

Description of Deficiency

The information provided in TR Section 3.1.3 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.3.4 states that, after installation, all wells will undergo a MIT before being placed into operation. Staff recommends that all wells should undergo a MIT before any use that is regulated or undertaken to meet a regulatory standard, including ground water sampling.

Formulation of RAI

Uranium One should revise the TR to state that the integrity of all wells will be verified by MIT before any use that is regulated or undertaken to meet a regulatory standard, including baseline water quality sampling.

RAI 52

Description of Deficiency

The information provided in TR Section 3.1.3 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.3.4 states that MITs will be performed on wells every five years after they are placed in service and after any workovers or suspected surface or subsurface damage. If a well fails the MIT it will be repaired or plugged and abandoned. Uranium One does not commit to evaluate the failure or potential contamination of any non-exempt aquifer as a consequence of the MIT failure of injection or extraction wells which have been in operation.

Formulation of RAI

Uranium One should provide a commitment to that if a well fails an MIT after being in service as a production or extraction well, Uranium One will assess the cause of the failure and evaluate if the well failure may have released fluids to a nonexempt aquifer.

RAI 53

Description of Deficiency

The information provided in TR Section 3.1.4 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.4.1 provides the lixiviant composition in Table 3.1. However, the table did not include the expected oxygen content in lixiviant. Staff needs the expected concentration of oxygen to assess if Uranium One will be able to maintain oxygen in solution during extraction operations in wellfields which have low potentiometric head or an unconfined aquifer (e.g. Peterson Satellite Wellfield 2). The release of oxygen from solution can lead to "gas lock" in the ore zone which can impact hydraulic control by reducing well injectivity and aquifer hydraulic conductivity unpredictably. Free gas can also lead to damage in pipes, pumps and other infrastructure which has not been designed to handle two phase flow of water and gas. Staff cannot provide reasonable assurance of the safe operation of the wellfields and wellfield infrastructure without information on the oxygen concentration and a determination if it will stay in solution during operations.

Formulation of RAI

Uranium One should provide the expected concentration of oxygen in the lixiviant to the composition in Table 3.1. The TR should discuss if these concentrations will remain in solution at all satellite wellfields and in wellfield infrastructure during operations. In addition, the TR should address if hydrogen peroxide is to be used in the lixiviant as it can also lead to the evolution of free oxygen gas in the ore zone aquifer.

RAI 54

Description of Deficiency

The information provided in TR Section 3.1.5 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.5 states that the wellfields will be composed of header houses and pipelines which will service the injection/recovery wellfields. The TR does not provide a schematic of the header house design.

Formulation of RAI

Uranium One should provide a schematic of the header house design.

RAI 55

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.6 provides a general discussion of the formation fracture pressure for the proposed license area. This information is not sufficient for staff to provide reasonable assurance that Uranium One will operate the injection and extraction wells below their specific formation fracture pressures at all times in the variable conditions expected at the proposed wellfields.

Formulation of RAI

Uranium One should provide an estimate of the formation fracture pressure for each proposed wellfield at the Leuenberger, North Platte and Peterson Satellites. In addition, Uranium One should provide a commitment to maintain injection pressure at a specific value based on the maximum allowable for the main trunk line into each header house.

RAI 56

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.6.1 provides the ROI for the 90 sand, 80 sand, and 70 sand as 550 ft, 500 ft, and 750 ft, respectively, based on the aquifer pumping tests. The TR also states there would be no impact to groundwater levels outside the project boundaries based on these estimates for the proposed bleed rate (15-45 gpm). These ROI were derived based on observations during the aquifer testing of these sands but the TR provided no calculations to support these numbers. Staff does not agree with Uranium One's definition of ROI. In practice, the ROI is defined by a function of transmissivity (T), time (t) and storage coefficient (S) in consistent units (Bear, 1979).

$$\text{ROI}=1.5*\text{sqrt}(\text{Tt/S})$$

Staff requires the ROI and drawdown which will be realized at each satellite to assess the impacts of consumptive use on surrounding private wells and to provide reasonable assurance of the safe operation of the satellites.

Formulation of RAI

Uranium One should provide: (a) the ROI using the estimated T, S and the time of production and restoration for each satellite wellfield; and (b) a prediction of the drawdown for each satellite wellfield within 2 km for each phase of operation using the appropriate consumptive use (e.g. 15-45 gpm).

RAI 57

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

In Addendum 2.7-F, Uranium One states that the Negley Subdivision has numerous domestic and stock wells located in the 120, 110 and 100 sands but none in the 90 or 80 ore zone sands. The closest of these private wells are within 1000 ft of the Leuenberger Wellfields. The 120, 110 and 100 sands are the overlying and uppermost aquifers at the Leuenberger Satellite Wellfields. These sands may experience contamination from spills, leaks or excursions from ISR operations which may go undetected. The TR reports the combined pumping rates for Negley domestic wells in the 100 and 110 sands was 5.61 gpm, and 2.1 gpm in the 120 sand. However, the TR did not include the rates for the stock wells in these sands which make the combined rates be substantially higher. The staff is concerned that the combined pumping rates of all domestic and stock wells may be sufficient to move any contamination in the 100, 110 and 120 sands from the Leuenberger Wellfields toward the Negley wells during the proposed operations. Uranium One did not assess the potential for such contamination to move toward the Negley wells in response to the ground water flow field created by the use of all domestic and stock wells in the Negley Subdivision. Staff cannot provide reasonable assurance of the safe operation of the Negley wells without an assessment of the potential for groundwater contamination to be drawn to the wells by the groundwater flow field created by the operations of all Negley wells. Additionally, staff cannot provide reasonable assurance that the Negley

Subdivision wells will be protected from undetected contamination from the Leuenberger Satellite operations without a guard well monitoring strategy.

Formulation of RAI

Uranium One should evaluate and provide: (a) the ground water flow direction and magnitude in the 120, 110 and 100 sands created by all of the Negley wells combined while operating at (1) their permitted rates, and (2) their reported rates over the life of the Leuenberger Satellite operations (2014-2023); (b) an estimate of the time of travel of any contamination from spills, leaks or excursions into these sands at the Leuenberger facility to reach any well at the Negley Subdivision using these two separate ground water flow field scenarios. Uranium One is encouraged to determine the time of travel using a worst case scenario for a spill, leak or excursion into the 120, 110 or 100 sands near the northern edge of Leuenberger Wellfield 1; (c) based on these groundwater flow field scenarios, provide a monitoring guard well strategy to detect the movement of any contamination from leaks, spills or excursions in the 120, 110 or 100 sands at the Leuenberger Satellite toward the Negley Subdivision wells. This guard well strategy is to be proposed in addition to the typical excursion monitoring of the overlying aquifers in the 100 and 110 sands.

RAI 58

Description of Deficiency

The information provided in TR Section 3.1.1 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.1 states that all production aquifers in the 90, 80 and 70 sands within the proposed license area are confined. However, staff has evaluated the characterization data presented for the 90 sand aquifer at Peterson Wellfield 2, and finds evidence that this aquifer is unconfined based on water levels and the aquifer pumping test at LPW-4.

Formulation of RAI

Please address the following topics with respect to operations at Peterson Wellfield 2 and any other production zone aquifer in the proposed license area which may be unconfined or is likely to become unconfined during operations:

- a. The limiting extraction rate for the unconfined aquifer for all operations (including excursion capture) to prevent excessive dewatering.
- b. A revised production schedule if this limiting extraction rate for the unconfined aquifer is determined to be less than the proposed bleed of 15-45 gpm required for production and restoration operations.
- c. Assurance that dissolved oxygen will be maintained at levels in the lixiviant to prevent "gas lock" when injected into the unconfined aquifer production zone.
- d. A strategy to detect and correct for "gas lock" in the unconfined aquifer production zone.
- e. A strategy to detect and correct for free gas in produced waters to prevent damage to piping, pumps and other wellfield infrastructure from the two phase flow of gas and water.
- f. An evaluation of the maximum drawdown and mounding expected during operations anywhere the unconfined aquifer.
- g. An evaluation which shows that an inward gradient in the wellfield will be maintained at all times with either five-spot, alternating line drive, or line drive patterns that may be

used within the unconfined aquifer. If necessary, please provide the updated bleed rate to maintain this inward gradient.

- h. A strategy for excursion capture in the unconfined aquifer given the limiting extraction rate.
- i. A strategy for assuring complete sweep of the unconfined aquifer during restoration of given the mounding and dewatering patterns which will develop.
- j. An updated flare value which takes into account the vertical flow from mounding and dewatering patterns in the unconfined aquifer.

RAI 59

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

On November 13, 2001, The Supreme Court of the United States issued the Modified North Platte River Decree which addressed water use from the North Platte River. In this decree, portions of the North Platte watershed are identified as hydrologically connected to the North Platte River. Within these regions surface water and ground water use for irrigation and other purposes are strictly controlled by a court order. Staff's review of the regional map (<https://sites.google.com/a/wyo.gov/seo/documents-data/maps-and-spatial-data>) for hydrologically connected areas near the North Platte River showed that the Peterson Satellite is located within the hydrologically connected region. Therefore all water use at this satellite, whether surface or ground water must be approved by WSEO to meet the requirements of the decree. Any evaporation or surge ponds must also meet the terms of the decree. Uranium One did not discuss the decree in its analysis of operations at the Peterson Satellite. The TR does not address implications for the safety of operations at the Peterson Satellite if water use is limited or restricted by WSEO under the decree. Staff cannot provide reasonable assurance of the safety of operations without an analysis of the impact of this decree on proposed operations.

Formulation of RAI

Uranium One should provide a discussion of the operation of the Peterson Satellite with respect to the water use restrictions for all wells and surface impoundments under the Modified North Platte River Decree. This discussion should:

- provide reasonable assurance that Uranium One will receive the necessary WSEO well permits to operate the wellfields and surface impoundments at the Peterson Satellite wellfields which are affected by the decree;
- provide assurance that wells will be permitted at required bleed and restoration rates (15-45 gpm) to ensure that the operations may be conducted safely;
- describe if this decree has the potential to reduce or revoke water well permits/rates or surface impoundments permits/rates at any time before restoration of the Peterson Wellfields is completed if water use is found to be in violation of the decree after operations start; and
- provide a commitment that if any changes to the wellfield design, ponds or water use are incurred by the WSEO under this decree before operations begin or during operations, Uranium One will inform NRC, so that a safety evaluation of these modifications may be made.

RAI 60

Description of Deficiency

The information provided in TR Section 3.1.6 does not meet the applicable requirements of 10 CFR Part 40 using review procedures in Section 3.1.2 and acceptance criteria outlined in Section 3.1.3 of the SRP.

Basis for Request

TR Section 3.1.6 presents a generic water balance for the production phase and restoration phase for all Ludeman satellites in Figures 3-6 and 3-7, respectively. The water balance was not specific to each satellite. The estimated waste disposal rate required at each satellite will be 60-160 gpm. The staff notes the field rates for existing DDWs in the Tecla Teapot Parkman formation (not projected permitted rates) at currently licensed ISR DDWs in the Powder River Basin are approximately 30 gpm on average. The TR indicates that only two DDWs will be installed for each satellite; therefore, each DDW would need to achieve rates of 30-80 gpm during operations. Staff cannot provide reasonable assurance that Uranium One has sufficient waste disposal capacity without a separate water balance at each proposed satellite for each phase of operation which includes realistic estimates of DDW rates based on field values from similarly situated DDW wells in the Powder River Basin.

Formulation of RAI

Uranium One should: (a) provide a separate waste water balance specific to each proposed satellite and phase of operation including production, production/restoration restoration for each year of operation in table format; and (b) demonstrate that only two DDW will be sufficient to handle the expected waste disposal rates of 60-160 gpm at each satellite. If, Uranium One determines two DDWs will not be sufficient, address how sufficient disposal capacity will be achieved.

RAI 61

Description of Deficiency

Application does not clearly summarize the proposed activities for the Ludeman Project.

Basis for Request

Staff has reviewed the application and understands that Uranium One's plans for the Ludeman Project include the following:

- The Ludeman Project would be a satellite facility to license SUA-1341. Loaded ion exchange resins generated at Ludeman will be shipped to the Willow Creek Central Processing Plant for the final stages of yellowcake production.
- Construction and operation of three satellite processing facilities (Leuenberger, North Platte, and Peterson). Each satellite processing facility would operate at 3,000 gpm measured on a monthly average basis.
- Liquid byproduct material would be disposed of via a series of Class I DDWs. As many as six wells are planned for the Ludeman Project. Additionally, Uranium One plans to construct as many as six surge ponds to provide disposal capacity on a temporary basis if any of the DDWs become inoperable.

Information from this clarification may be included as part of a standard license condition. This clarification is intended to prevent confusion related to development of those license conditions, if the staff finds the application acceptable from a safety and environmental standpoint.

Formulation of RAI

Please confirm that the staff has correctly interpreted Uranium One's proposed action.

RAI 62

Description of Deficiency

Uranium One has not provided sufficient information regarding the ISR mine unit operation and instrumentation and control.

Basis for Request

Section 3.3.3 (3) of the SRP states that facility instrumentation is acceptable if: "Control components on the systems are equipped with backup systems that activate in the event of a failure of the operating system or a common cause failure such as power failure." Section 3.3 of the TR does identify the presence of backup monitoring monitors and alarms. However, the TR does not appear to identify any other engineering or operational features available in the well fields or satellite processing plants. Staff's position is that monitoring alone does not constitute a backup system.

Section 3.3.3 (4) of the SRP states facility instrumentation is acceptable if: "Well field operating pressures are kept below casing and formation rupture pressures to prevent vertical excursions. Well field operation pressures are routinely monitored either at the well head or on the entire system, and are measured and recorded daily." Staff is not able to verify that Uranium One will operate the injection wells in a manner that prevents vertical excursions.

Formulation of RAI

The following information should be provided in the application:

- The descriptions of the process and well field instrumentation and controls and radiation safety monitoring instrumentation need to be more detailed and specific, including their minimum specifications and operating characteristics (alarms, interlocks, etc.). Specifically, please discuss backup systems that will be available to control process fluids within the satellite processing plants or well fields in the event of a power failure or other potential disruption in operations.
- A discussion of well casing max operating and formation fracture pressures.

Section 4 - Effluent Control Systems

RAI 63

Description of Deficiency

The information provided in TR Section 4.1.3 does not meet SRP Section 4.1.3 acceptance criterion (3).

Basis for Request

Acceptance criterion (3) of SRP Section 4.1.3 states, that the application should demonstrate that adequate ventilation systems are planned for process buildings to avoid radon gas buildup. Ventilation systems should be consistent with the requirements of Regulatory Guide 8.31.

Further, the acceptance criterion states that the review emphasis should be on uranium particulate emissions resulting from spills in addition to emissions from drying uranium and radon.

TR Section 4.1.3 states that no potential hazardous air particulate effluents will be produced because the proposed licensed facility will consist of only wellfield and ion exchange operations, and no yellowcake processing occurs where airborne particles could be present. The staff disagrees with Uranium One's position and believes the TR should address air particulates produced from spills or radon progeny build-up within header houses.

Radon-222, a radioactive gas with a 3.8-day half-life, decays to several solid particles that tend to be electrically charged and can deposit on surfaces or attach to dust particles (Mohamed et al., 2008). Radon progeny can build-up in buildings, such as the header houses, if the ventilation is not adequate to ensure complete air exchange. Further, NUREG/CR-6733 states that spills of radioactive liquids can be a source of air particulates and pose an inhalation hazard if the spills dry before the applicant cleans the spills.

Formulation of RAI

Provide information in the TR that describes engineering controls and ventilation that will be used to limit buildup in the workplace or airborne releases of radon progeny and uranium particulates.

RAI 64

Description of Deficiency

The information provided in TR Section 4.1.3 does not meet SRP Section 4.1.3 acceptance criterion (1) or the review procedures in SRP Section 3.3.2.

Basis for Request

In TR Section 4.1 Uranium One states that radon gas may potentially be released in the satellite facilities as a result of solution spills, ion exchange (IX) resin transfer operations, and maintenance activities, and that routine monitoring of radon progeny, as described in TR Section 5.7.3.2, will identify exposure levels and initiate corrective actions, if necessary, to ensure exposures of workers are maintained ALARA in accordance with 10 CFR 20.1101(b).

Uranium One will only measure the radon progeny present at the time of sampling to demonstrate compliance with the regulatory occupational exposure limits. The proposed instrumentation will not be able to demonstrate ALARA. Uranium One has not described instrumentation to detect radon gas buildup in buildings that are consistent with SRP Section 3.3.2.

Formulation of RAI

Provide justification for not using instrumentation designed to detect radon gas buildup in buildings consistent with review and acceptance criteria in SRP Sections 3.3.2. and 4.1.3.

RAI 65

Description of Deficiency

Section 4.2.3 of the TR indicates that Uranium One does not currently have an agreement in place for the disposal of 11e.(2) byproduct material. Uranium One is required to have an NRC approved agreement in place for the disposal of 11e.(2) byproduct material before

operation commences.

Basis for Request

Section 4.2.3(6) of the SRP requires that the applicant have an NRC approved agreement in place for the disposal of 11e.(2) byproduct material before operation commences. Section 4.2.3 of the TR states, "SUA-1341 currently has an agreement with pathfinder mine Corporation Shirley Basin Facility which will be modified to include shipment of 11e.(2) byproduct materials from the proposed Ludeman Project facilities."

Formulation of RAI

Uranium One should: (1) modify Section 4.2.3 of the TR, and all other applicable sections of the TR, by committing to have a signed agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project facilities prior to commencing operations at the site; or (2) indicate where in the TR the commitment is made.

RAI 66

Description of Deficiency

Section 4.2.3 of the TR does not include a commitment to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination.

Basis for Request

Section 4.2.3(6) of the SRP requires that the applicant commit to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination.

Formulation of RAI

Uranium One should: (1) modify Section 4.2.3 of the TR, and all other applicable sections of the TR, by including a commitment to notify NRC in writing within 7 days if the NRC approved agreement with Pathfinder Mine Corporation Shirley Basin Facility for the shipment of 11e.(2) byproduct materials from the proposed Ludeman Project expires or is terminated and to submit a new agreement for NRC approval within 90 days of the expiration or termination; or (2) indicate where in the TR the commitment is made.

RAI 67

Description of Deficiency

Section 4.2.4.4 of the TR appears to be out of date.

Basis for Request

Section 4.2.4.4 of the TR states: "In this regard, Uranium One anticipates submittal of a Class 1 injection well permit during the second quarter of 2010."

Formulation of RAI

Uranium One should modify Section 4.2.4.4 of the TR, and all other applicable sections of the TR, by stating when the Class 1 injection well permit was submitted.

RAI 68

Description of Deficiency

Section 4.2.4.4 of the TR references Section 8.3 for additional discussion of the liquid waste disposal alternative considered by Uranium One. Section 8.3 does not exist in the TR. The staff believes the correct reference is Section 8.1.7.

Basis for Request

Section 4.2.4.4, of the TR states: "Further discussion of the liquid waste disposal alternatives considered by Uranium one is contained in Section 8.3 of this TR."

Formulation of RAI

Uranium One should modify Section 4.2.4.4 of the TR, and all other applicable sections of the TR, by referencing Section 8.1.7 instead of Section 8.3.

RAI 69

Description of Deficiency

Section 4.2.4.5.2 of the TR states that surge pond inspections will be done weekly. This inspection frequency appears to be inconsistent with the Section 4.2.3(2) of the SRP.

Basis for Request

Section 4.2.4.5.2 of the TR states: "The surge pond inspection plan is based on the routine weekly inspections currently required in SUA-1341 for the Willow Creek evaporation ponds. Weekly inspections will consist of checking the pond depth and visually inspecting the pond embankments for slumping, movement, or seepage. The pond depth measurements will be checked against the freeboard requirements. The liner system will be visually inspected to identify any damage."

Section 4.3.2(2) of the SRP states: "The monitoring and inspection program consists of documented daily checks of impoundment freeboard and leak detection system."

Formulation of RAI

Uranium One should modify Section 4.2.4.5.2 of the TR, and all other applicable sections of the TR, to be consistent with Section 4.3.2(2) of the SRP, or justify why weekly inspections are adequate.

RAI 70

Description of Deficiency

The application does not provide sufficient information regarding the disposal of solid and liquid wastes generated by the operations at the Ludeman facility. The information requirements are specified Regulatory Guide 3.11, Section 4.2 of the SRP for ponds, and Section 6.1 for DDWs.

Basis for Request

Uranium One has provided a general overview of how it plans to dispose of solid and liquid waste generated by the operations at Ludeman. In many instances, the TR only contains a

conceptual description of Uranium One's plans. The staff is unable to verify the following information related to the liquid effluents at the proposed facility:

- Section 6.1.3 (13) of the SRP identifies acceptance criteria for deep well injection of liquid wastes. The TR does not contain sufficient details about the planned DDWs. The TR identifies the Parkman Formation as a possible target zone for the DDWs, but the geologic cross sections in Section 2 of the TR do not show where the Parkman Formation is located at Ludeman. Additionally, the relationship between the location of the target zone for the deep injection wells and nearby oil and gas wells is not clear to the staff.
- Section 4.2.3 (3) of the SRP identifies disposal capacity as an issue for staff's review. The TR does not contain sufficient information related to the water balance for the facility. As a result, the staff cannot verify if adequate disposal capacity is available for liquid byproduct material. Based on the staff's review of the water balances in TR Figures 3-6 and 3-7 and Uranium One's proposed schedule in TR Figure 3-10, staff estimates that the peak disposal need in year 7 of operations would vary between 772.1 Lpm and 1907.6 Lpm (204 gpm and 504 gpm). Uranium One has not demonstrated that adequate disposal capacity is available for liquid byproduct material. Additionally, it is not clear to the staff if the water balance presented is representative of the conditions at each satellite facility. Staff experience indicates that wellfield size is a major factor in the time period necessary to complete ground water restoration activities. Additionally, it is not clear if the DDWs are dedicated to a specific satellite processing facility, or if Uranium One will be able to transfer liquid byproduct material generated at one satellite facility for disposal at a DDW located in another portion of the Ludeman site.
- Section 4.2.4 (4) of the SRP identifies subgrade preparation as an issue for the staff's review. Subgrade preparation is dependent on the soil conditions in the vicinity of the storage ponds. The application does not appear to contain discussion of geotechnical conditions in the vicinity of the surge ponds. The results of the geotechnical investigation should also discuss the liquefaction potential of the soils that will be used to construct the storage pond embankments.
- Section 4 of Regulatory Guide 3.11 identifies the need for proper characterization of ground water prior to use of a pond. The geotechnical investigation for the proposed pond locations should also include characterization of the uppermost aquifer in the vicinity of each surge pond. This is consistent with the recommendations provided in Section 1.2 of Regulatory Guide 3.11.
- Section 4.2.4 (4) of the SRP identifies slope preparation as an issue for the staff's review. Staff recognizes that Uranium One has presented analyses addressing slope stability and settlement. However, these analyses were based on assumed soil properties.
- Uranium One does not appear to have presented a pseudostatic slope stability analysis. As discussed in Section 2.1.1.3 of Regulatory Guide 3.11, a slope stability analysis considering earthquake loading should be performed.
- Section 2.1.2 of Regulatory Guide 3.11 identifies liquefaction as a factor that should be considered for retention system design. The application does not appear to have addressed potential for liquefaction in the vicinity of the surge ponds. The analysis for the potential of liquefaction should be based on the results of the geotechnical investigation.
- Section 4.2.4 (4) of the SRP indicates that design details and drawings should be provided to the staff. Staff recognizes that Uranium One has presented conceptual

drawings showing the layout of each pond. However, these conceptual drawings do not show the grading and drainage characteristics in the vicinity of each pond. Therefore, the staff is not able to verify that the ponds have been designed to prevent run-on from entering the ponds.

- Uranium One based its freeboard analysis of the ponds on a six hour, 25 year storm event. This is not consistent with the approach recommended in Regulatory Guide 3.11, which recommends basing pond capacity and freeboard requirements on a six hour probable maximum precipitation event.
- Section 4.2.4 (4) of the SRP identifies deterioration of the liner system when exposed to waste products as an item for staff to consider. The application does not appear to address chemical compatibility of the liner system with the anticipated composition of the liquid byproduct material. The TR does address compatibility issues in general, but not the specific aspects at the Ludeman Project. Note the Renken 2005 reference cited in the TR Section 4.2.4.5.1 text is not contained in the reference list at the end of that section, so staff has not been able to locate and review to reference to determine its applicability.
- The proposed surge pond monitoring program is not consistent with the guidance in acceptance criteria (2) in Section 4.2.3 of the SRP or with Section 4.2 of Regulatory Guide 3.11. Specifically, the proposed monitoring program does not appear to include daily inspections of freeboard or the leak detection system.
- Section 4.2.4 (4) of the SRP identifies construction methods, design details, and QA programs as items that should be considered during the staff's review. The TR does not include a set of construction specifications for the surge ponds.
- Section 4.2.4 (1) of the SRP identifies decommissioning aspects of waste disposal as an item for staff's consideration during a review. The TR does not include a discussion of decommissioning aspects of the surge ponds.
- Section 4.2.4 (5) identifies secondary containment as an item for consideration during the staff's review. Staff has not been able to verify that adequate secondary containment is available within the satellite processing facilities.

Formulation of RAI

The following information should be provided in the application, or Uranium One should direct the staff to where the information can be found:

- identify the status of the DDW application, the target formation, and the number of DDWs necessary to provide sufficient disposal capacity;
- a water balance that demonstrating that sufficient disposal capacity is available at the facility. The water balance should reflect differences in operating characteristics that may exist for each satellite facility;
- the results of the geotechnical investigation for the proposed pond locations, including discussion of soil classification, grain size analysis, plasticity index, moisture content, as well as compaction and density requirements for soils that may be used to construct the perimeter embankments;
- characterization of groundwater in the vicinity of the surge ponds. This should include depth to groundwater, groundwater flow direction and gradient, as well as groundwater quality. Based on this information, Uranium One should identify locations for groundwater monitoring wells around each surge pond;
- updated slope stability analyses to reflect the actual site conditions identified during the site investigation;

- a slope stability analysis that considers earthquake loading conditions;
- an analysis on the potential for liquefaction in the vicinity of the surge ponds;
- drawings showing the location of each surge pond and the surrounding topography at a sufficient level of detail to demonstrate that run-on is diverted around the surge ponds;
- a re-evaluation of the freeboard based on the PMP event, or provide justification as to how the six hour, 25 year storm event combined with site features provides an adequate level of protection to prevent loss of byproduct material during a significant storm event;
- a discussion of potential deterioration of the liner system when exposed to the anticipated wastes;
- a comparison of the proposed pond inspection program to the recommendations in Regulatory Guide 3.11 and explain how deviations from the guidance provide an equivalent level of protection;
- a set of construction specifications for the surge ponds so staff can evaluate whether or not the pond liner system will be installed in a manner that is protective. This should include a QA plan for soil and liner installation;
- a discussion addressing timing of decommissioning, surface reclamation, and any unique aspects of radiological surveys necessary to complete the work; and
- a discussion of the volume of the largest tank in each satellite facility as well as the volume of liquid contained within the concrete curbs in each satellite facility.

Section 5 – Operations

RAI 71

Description of Deficiency

Section 5.1 of the TR does not identify the manager responsible for the QA function at the Ludeman facility.

Basis for Request

Section 5.1 of the SRP requires the staff to review the organizational structure including the functional description of the key management positions to ensure that sufficient detail is provided for positions responsible for developing, reviewing, approving, implementing, and enforcing the proposed programs related to radiological safety, environmental safety, ground-water protection, QA, and maintenance.

Formulation of RAI

Uranium One should modify Section 5.1 of the TR, and all other applicable sections of the TR, to identify the key management position responsible for the QA function for operations at the Ludeman facility.

RAI 72

Description of Deficiency

Management positions described in Sections 5.1.1 – 5.1.8 of the TR are not always consistent with the organization chart provided in Figure 5-1.

Basis for Request

Sections 5.1.4, 5.1.5, and 5.1.7 reference a position titled, Manager Site SHE. Figure 5-1 identifies a position titled Manager Satellite SHE

Section 5.1.6 references the Satellite Operations Manager.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that the management positions identified on Figure 5-1 are consistent with the position descriptions described in Sections 5.1.1 – 5.1.7.

RAI 73

Description of Deficiency

The functional description for the Satellite Operations Manager (Section 5.1.6) is not adequately reflected on Figure 5-1.

Basis for Request

Section 5.1.6 states: “All site operations, maintenance, construction, and support groups report directly to the Satellite Operations Supervisor and environmental health and safety have coordinating reporting responsibilities as shown in Figure 5-1.” There is no indication from Figure 5-1 that the Satellite Operations Manager is the highest level manager located at the Ludeman facility. Further, Figure 5-1 does not show that there is a coordinating responsibility between the Satellite Operations Manager and Manager Satellite SHE.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that the organizational structure shown on Figure 5-1 is consistent with management functional responsibilities at the Ludeman facility.

RAI 74

Description of Deficiency

The functional description for the RSO (Section 5.1.9.1.1) is not consistent with Section 5.2.2 of the LRA for SUA-1341.

Basis for Request

TR Section 5.1.9.1.1 (3) says the RSO will: “Assist with the review and approval of new equipment, process changes or operating procedures to ensure that the plans do not adversely affect the RPP.”

Section 5.2.2 of the LRA states that: the RSO must approve procedures and changes to procedures.

Formulation of RAI

Uranium One should revise Section 5.1.9.1.1 of the TR, and all other applicable sections of the TR, to state that the RSO must review and approval of new equipment, process changes or operating procedures to ensure that the plans do not adversely affect the RPP.

RAI 75

Description of Deficiency

TR Section 5.1.10 is inconsistent with License Condition 12.2 of SUA-1341 and Section 5.2.3(12) of the SRP.

Basis for Request

Section 5.1.10 states: "Reporting of excursions and corrective actions will be conducted as described in Section 5.7.8." Section 5.7.8.2.6 of the TR provides that Uranium One will submit a written report to the NRC within 60 days of the excursion confirmation. Section 5.2.3(12) of the SRP and License Condition 12.2 of SUA-1341 indicate that a written report should be submitted to the NRC within 30 days of the excursion notification.

Formulation of RAI

Uranium One should revise Section 5.7.8.2.7 of the TR, and all other applicable sections of the TR, to ensure that excursion reporting requirements are no less stringent than Section 5.2.3(12) of the SRP, and consistent with License Condition 12.2 of SUA-1341.

RAI 76

Description of Deficiency

TR Section 5.2.4, Safety and Environmental Review Panel, states: "The SERP process and procedures that will apply to the proposed project are described in Section 5.2.2 of the LRA for SUA-1341." The SERP procedures to be implemented for the Willow Creek facility are not applicable to the Ludeman facility because management positions of responsibility are not identical for Willow Creek and Ludeman.

Basis for Request

Section 5.2.2, Safety and Environmental Review Panel, of the LRA for SUA-1341 states: "One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and shall have responsibility for implementing any operational changes; and, one member shall be either the RSO or equivalent (typically, the Manager, Environmental and Regulatory Affairs), for the responsibility of assuring changes conform to radiation safety and environmental requirements."

The organizational structure for the Ludeman facility, as provided in Section 5.1 of the TR, does not include Manager, Environmental and Regulatory Affairs.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to include a Manager, Environmental and Regulatory Affairs, or revise Section 5.2.4 of the TR to provide an accurate description of the SERP.

RAI 77

Description of Deficiency

Section 5.3, Management Audit and Inspection Program, references Section 5.3 of the LRA for SUA-1341, which does not directly apply to the Ludeman facility.

Basis for Request

Section 5.3, states: "The management audit and inspection program for the proposed Ludeman Project will be the same as that described in Section 5.3 of the LRA for SUA-1341." It is

insufficient to reference 5.3 of the LRA for SUA-1341 for the following reasons: (1) there is no Central Processing Plant proposed for Ludeman facility; (2) the LRA is written specifically for the Christensen Ranch and Irigaray Plant facilities; and (3) the LRA identifies responsibilities for the Site/Construction Manager which does not exist for Ludeman.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, to describe a management audit and inspection program that is specific to the Ludeman project

RAI 78

Description of Deficiency

Section 5.3.1, Surge Pond Inspections, does not include a commitment to inspect surge ponds in accordance with Regulatory Guide 8.31.

Basis for Request

Section 5.3.3 of the SRP states that the management audit and inspection plan will be acceptable if it is consistent with Regulatory Guides 3.11 and 8.31. In Section 5.3.1 Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11, but as discussed in RAIs 70 and 79, Uranium One has proposed a surge pond monitoring plan that is not consistent with this guidance document. Additionally, Uranium One does not commit to conduct inspections to ensure exposures are ALARA in accordance with Regulatory Guide 8.31, Section 2.3.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, to commit to conducting surge pond inspections in accordance with Regulatory Guide 8.31.

RAI 79

Description of Deficiency

Section 5.3.1.1, Inspection Frequency and Reporting, is not consistent with the Regulatory Guide 3.11. Further, TR does not include discussion of special inspections as provided in Regulatory Guide 3.11, Section 4.2.

Basis for Request

In Section 5.3.1 of the TR, Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11. Section 5.3.1.1 states: "During operations, the leak detection standpipes will be checked for evidence of leakage on a weekly frequency. Visual inspection of the pond embankments, fences and liners and the measurement of pond freeboard will be performed on the same frequency.

Regulatory Guide 3.11, Section 4.2, states that detection standpipes, pond embankments, and liners should be inspected on a daily basis. In Section 5.3.1 Uranium One commits to inspect surge ponds in accordance with Regulatory Guide 3.11, but does not commit to conduct inspections to ensure exposures are ALARA in accordance with Regulatory Guide 8.31, Section 2.3.

Formulation of RAI

Uranium One should revise Section 5.3 of the TR, and all other applicable sections of the TR, such that the surge pond inspection frequencies and special inspections are consistent with Regulatory Guide 3.11.

RAI 80

Description of Deficiency

Section 5.4, Radiation Safety Staff Qualifications, is insufficient.

Basis for Request

Section 5.4 states: "The requirements for education, experience, and training for radiation safety staff for the proposed Ludeman project will be the same as that described in Section 5.4 of the LRA for SUA-1341."

Referencing Section 5.4 of the LRA for SUA-1341 in the Ludeman application is insufficient for the following reason: (1) the qualification requirements for the RSO in Section 5.4 of the LRA is inconsistent with Regulatory Guide 8.31; and (2) the LRA provides no qualifications for an RSO designee, when a designee is assigned responsibility for conducting inspections.

Formulation of RAI

Uranium One should revise Section 5.4 of the TR, and all other applicable sections of the TR, by providing specifying qualification requirements for the RSO and RSO designee, which are consistent with Regulatory Guide 8.31.

RAI 81

Description of Deficiency

Section 5.6.1, License Area and Facility Security, assigns responsibility for facility security to a management position not identified in Section 5.1.

Basis for Request

Section 5.6.1 states: "Visitors will only be allowed at the facility during regular working hours unless prior approval is obtained from the General Manager, Wyoming Operations." Section 5.1 of the TR does not include this position in the Corporate Organization Chart.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, by including the position of General Manager, Wyoming Operations, in the Corporate Organization.

RAI 82

Description of Deficiency

Section 5.7.1.2.1.3, assigns responsibility for SERP functions to management positions not identified in Section 5.1.

Basis for Request

Section 5.7.1.2.1.3 states: "At least once per year, the Manager of Health, Safety, and Environmental Affairs will convene the SERP to review the cause of recent spills. The SERP will consist of at least three individuals with experience in operations. After reviewing the causes of recent spills, the SERP will send a report to the facility manager detailing reasonable recommendations on how to prevent and minimize the size of future spills." Section 5.1 of the

TR does not include Manager of Health, Safety, and Environmental Affairs and Facility Manager in the Corporate Organization Chart.

Formulation of RAI

Uranium One should revise Section 5.1 of the TR, and all other applicable sections of the TR, to ensure that management positions having responsibility for health and safety and environmental management are included in the Corporate Organization Chart.

RAI 83

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with SRP Section 5.7.2.3 acceptance criterion (4).

Basis for Request

Acceptance criterion (4) of SRP Section 5.7.2.3 states that all monitoring equipment should have a LLD that allows measurements of 10 percent of the applicable limits. Planned surveys of external radiation are consistent with the guidance in Regulatory Guide 8.30, "Health physics Surveys in Uranium mills," Section 1 (NRC, 2002a).

In Section 5.7.2.1 Uranium One describes the MDL for gamma survey equipment, but does not describe the LLD. Regulatory Guide 8.30, states that all monitoring equipment should have an LLD that allows measurement of 10 percent of the applicable limits in 10 CFR 20.

Formulation of RAI

Provide the LLD of monitoring equipment as described in Regulatory Guide 8.30, "Health Physics Surveys in Uranium Mills," Section 1 (NRC, 2002).

RAI 84

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with SRP Section 5.7.2.3 acceptance criterion (6).

Basis for Request

Acceptance criterion (6) of SRP Section 5.7.2.3 states that the application should present radiation dose levels for corrective action that are consistent with the 10 CFR Part 20 regulatory requirements. Uranium One did not establish, nor describe in the application, action levels for the dosimetry monitoring program above which the RSO should determine the cause and/or corrective actions. Recommendations for establishing actions levels for a monitoring program are found in Regulatory Guide 8.30, Section 4.6.

Formulation of RAI

Describe action levels for the monthly or quarterly personnel dosimetry monitoring.

RAI 85

Description of Deficiency

The information provided in TR Section 5.7.2 is not consistent with 10 CFR 20.1501 (survey for potential hazards) or Regulatory Guide 3.46 (Standard Format and Content for ISRs).

Basis for Request

In TR Section 5.7.2.1 it states,

The processing, drying and packaging of yellowcake activities are not proposed to be conducted at the proposed project and would not require beta surveys as recommended in USNRC Regulatory Guide 8.30, Section 1.4.

The staff believes Uranium One should conduct beta surveys due to the potential build-up of Pb-210, a beta emitter and a radon progeny.

Formulation of RAI

Uranium One should: (1) demonstrate what the static and scan MDC for alpha measurements are; and (2) either (a) propose measuring betas, or (b) relate the beta activity to the measured alpha activity. In order to have a relationship of alphas to betas, Uranium One will need to account for all sources of alphas and betas, including potential alpha and beta sources that are not in equilibrium with the uranium. This would apply to personnel and the release of items for unrestricted use (e.g. TR Section 5.7.6 Contamination Control).

RAI 86

Description of Deficiency

The information provided in TR Section 5.7.3 is not consistent with SRP Section 5.7.3.3 acceptance criterion (3).

Basis for Request

TR Section 5.7.3.1 states:

Routine airborne uranium particulate sampling is not proposed for the Satellite facilities at Ludeman because there are no elution, precipitation, or drying activities in these facilities that would be a potential source of airborne uranium. However, airborne uranium particulate monitoring may be necessary during some maintenance or other activities performed under an RWP. Airborne uranium monitoring required for these activities will be performed in accordance with the approved program under SUA-1341.

The TR does not address the potential build-up of other isotopes from residual spills and radon decay that may occur in the satellite facilities.

Staff notes that whereas in a conventional mill Th-230 is in secular equilibrium with U-238 and U-234, it is unlikely to be measured in an ISR plant because thorium is extremely insoluble and not observed to appreciably leach from the ore into groundwater or lixiviant. The half-lives of U-234 and Th-230 are too long to generate build-up of Th-230 from the decay of U-234 in the plant. Therefore, Th-230 build-up within satellite facilities is unlikely. However, Th-234, a U-238 progeny and beta-emitter with a 24 day half-life, approaches secular equilibrium with U-238 within 90 days. Radon-222 decays to several solid particles that tend to be electrically charged and can deposit on surfaces or attach to dust particles and build-up in if the ventilation is not adequate to ensure complete air exchange. Lead-210 and Po-210 are longer lived radon progeny that may be detected in air samples.

Formulation of RAI

Uranium One should include Th-234, Pb-210, or Po-210 in the air particulate sampling program or provide justification for their exclusion.

RAI 87

Description of Deficiency

The information provided in TR Section 5.7.3 is not consistent with SRP Section 5.7.3.3 acceptance criterion (1).

Basis for Request

Acceptance criterion (1) of SRP Section 5.7.2.3 states that the applicant should provide one or more drawings that depict the facility layout and the location of samplers for airborne radiation and that locations of samplers should be consistent with Regulatory Guide 8.30. Figure 5.2 of the TR does not identify the location of air particulate samplers. Figure 5.2 only shows where Radon and gamma dose rates will be surveyed. Further, TR Section 5.7.3.1 states that routine airborne uranium particulate sampling is not proposed for the Ludeman satellite facilities because no drying or packaging activities will be conducted. Uranium One does not address the potential for spills which can be a source of airborne particulates. Although, Regulatory Guide 8.30 does not address sampling for spills, the regulatory guide states that the purpose for airborne uranium particulate sampling is to determine whether exposures to radioactive materials are being maintained ALARA as stated in 10 CFR 20.1101 and 20.1702.

Formulation of RAI

Provide the location of airborne particulate sampling in the satellite facilities.

RAI 88

Description of Deficiency

The information provided in TR Section 5.7.6 is not consistent with SRP Section 5.7.6.3 acceptance criterion (4).

Basis for Request

Acceptance criterion (4) in SRP Section 5.7.6.3, states the applicant should describe monitoring equipment by type, specification of the range, sensitivity, calibration methods and frequency.

TR Section 5.7.6 states that Uranium One will perform surveys for surface contamination in operating and clean areas in accordance with the guidelines contained in Regulatory Guide 8.30.

Uranium One states that it will conduct surveys for contamination of skin and personal clothing and surveys for release of equipment and materials in accordance with the current program approved in SUA-1341. The staff notes that current program approved in SUA-1341 does not address beta surveys. However, License SUA-1341 is currently under review for renewal and it does address the need for beta surveys.

Formulation of RAI

Provide a description of beta survey equipment and procedures to be used for contamination control and release of personnel and equipment.

RAI 89

Description of Deficiency

The information provided in TR Section 5.7.6 is not consistent with SRP Section 5.7.6.3 acceptance criteria (1) and (2).

Basis for Request

SRP Section 5.7.6.3 acceptance criteria (1) states that radiation surveys of workers will be conducted to prevent contaminated employees from entering clean areas or from leaving the site in conformance with guidance in Regulatory Guide 8.30.

SRP Section 5.7.6.3 acceptance criteria (2) states Requirements for a contamination control program are included in standard operating procedures or are discussed in the application.

The TR does not provide any details on requirements for a contamination control program, such as maintaining change areas and personal radiation monitoring before leaving radiation areas. Further, the TR does not discuss a contamination control program will prevent contaminated employees from entering clean areas or from leaving the site to ensure contamination limits comply with Regulatory Guide 8.30.

Formulation of RAI

Provide a description of radiation surveys of workers that will be conducted to prevent contaminated employees from entering clean areas or from leaving the site in conformance with guidance in Regulatory Guide 8.30 and 10 CFR 20.1501.

RAI 90

Description of Deficiency

The information provided in TR Section 5.7.7 is not consistent with SRP Section 5.7.7.3 acceptance criteria (1) and (2).

Basis for Request

SRP Section 5.7.7.3 acceptance criterion (1) says the proposed airborne effluent and environmental monitoring program is consistent with Regulatory Guide 4.14, Sections 1.1 and 2.1 (NRC, 1980) and ALARA requirements as described in Regulatory Guide 8.37, Section 3.

SRP Section 5.7.7.3 acceptance criterion (2) says the proposed locations of the effluent monitoring stations are consistent with guidance in Regulatory Guide 4.14, Sections 1.1.1 and 2.1.2. Uranium One should consider site-specific aspects of climate and topography in determining the number and locations of off-site airborne monitoring stations and environmental sampling areas. The criteria used in selecting sampling locations should be given. All sampling locations should be clearly shown relative to the proposed facility, nearest residences, and population centers on topographic maps of the appropriate scale.

TR Section 5.7.7 implies that environmental monitoring is effluent monitoring and does not describe effluent monitoring stations that are consistent with guidance in Regulatory Guide 4.14, Sections 2.1, which states that stacks other than dryers should be sampled at least semiannually and adequate for the determination of the release rates and concentrations of uranium, thorium-230, radium-226, and lead-210.

The applicant must demonstrate compliance with 10 CFR 40, Appendix A, Criterion 8, which requires licensees ensure that all effluent releases are reduced ALARA. Uranium One states it will use MILDOS-Area to calculate effluent releases and describes environmental monitoring

locations. However, models need to be validated with sampling to confirm calculations. Therefore, Uranium One is not consistent with SRP Section 5.7.7.3 acceptance criteria (1) and (2), which requires following sampling and ALARA recommendations in Regulatory Guides 4.14 and 8.37.

Formulation of RAI

Provide a description of how, in accordance with 10 CFR 40.65, the quantity of the principal radionuclides from all point and diffuse sources will be accounted for, and verified by, surveys and/or monitoring.

RAI 91

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.1 discusses baseline monitoring programs for the wellfields. The TR does not state the density of wellfield baseline wells to be sampled to establish restoration target values. Staff generally recommends one well per acre of wellfield. Uranium One stated each well will be sampled four times at least 2 weeks apart. The first and second sample events will include all of the WDEQ Guideline 8 constituents. The third and fourth samples will have a reduced list of constituents known as Assay Suite B. Staff requires that all samples be analyzed for all WDEQ Guideline 8 constituents unless they were non-detect in the first two samples. Staff cannot have reasonable assurance that the wellfield ground water baseline has been statistically established without knowledge of the density of baseline wells and with less than four complete rounds of Guideline 8 samples.

Formulation of RAI

Uranium one should provide the density of wellfield baseline water quality wells for each proposed wellfield and a commitment to sample all baseline wells four times at least two weeks apart for all Guideline 8 constituents unless a constituent was non-detect in both of the first two samples to establish baseline water quality for each wellfield.

RAI 92

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.2, states that if a well in a low permeability aquifer does not recover sufficiently to allow two casing volumes to be removed or maintain a rate to check for stability of pH, conductivity, temperature and main constant water levels, a sample will be retrieved by pumping the well dry once and then bailing the water. Staff does not find this method provides reasonable assurance that a representative sample has been retrieved.

Formulation of RAI

Uranium One should provide a commitment to remove two casing volumes or use low flow sampling approved by the WDEQ to obtain samples. If a low permeability aquifer is

encountered, which cannot be sampled using these methods, Uranium One should provide evidence that it does not meet the definition of an “aquifer.”

RAI 93

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.3 states that the overlying aquifer, underlying aquifer and perimeter ring monitoring wells will be sampled four times at least two weeks apart. The first sample will be analyzed for all WDEQ Guideline 8 constituents. The last three will be analyzed for a reduced list of constituents known as Assay Suite B. Staff requires that all samples be analyzed for all WDEQ Guideline 8 constituents unless they were non-detect in the first two samples. Staff cannot have reasonable assurance that the wellfield ground water baseline has been statistically established for the perimeter ring, overlying and underlying aquifers with less than four complete rounds of Guideline 8 samples.

Formulation of RAI

Uranium One should provide a commitment to sample all wellfield perimeter ring, overlying and underlying aquifer monitoring wells four times at least two weeks apart for all Guideline 8 constituents unless a constituent was non-detect in both of the first two samples to establish baseline water quality in the perimeter ring, overlying and underlying aquifers associated with the wellfield.

RAI 94

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR does not discuss the location of the screen interval for the wellfield baseline monitoring wells or for the perimeter ring, overlying aquifer or underlying aquifer monitoring wells. Staff cannot have reasonable assurance that the baseline water quality or excursion monitoring is being conducted to ensure the safe operation of the wellfields without this information.

Formulation of RAI

Uranium One should provide the proposed location of the screen interval for all wellfield baseline monitoring wells and for the perimeter ring, overlying aquifer or underlying aquifer monitoring wells for each proposed wellfield at the Leuenberger, North Platte and Peterson Satellites. Uranium One should also provide a commitment to provide the “as-built” screen intervals for the wellfield baseline monitoring wells and the perimeter ring, overlying aquifer or underlying aquifer monitoring wells for each wellfield in the wellfield hydrologic data package.

RAI 95

Description of Deficiency

The information provided in TR Section 5.7.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

TR Section 5.7.8.2.4 states that Uranium One will provide all wellfield hydrologic data packages to WDEQ for review. NRC staff must also receive the wellfield packages to verify the wellfield characterization did not uncover any unexpected features which may impact the safe operation of the wellfield as approved in the license and to have a record of the “as-built” wellfield.

Formulation of RAI

Uranium One should provide a commitment to provide all wellfield hydrologic data packages for the Leuenberger, North Platte and Peterson Satellites to NRC for verification.

RAI 96

Description of Deficiency

The information provided in the TR Section 7.2.5 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR does not provide any commitment or plan to conduct private well groundwater quality monitoring in any portion of the proposed license area. In Section 7.2.5.2.1 Uranium One stated it would conduct private well monitoring at the Negley Subdivision as required by NRC. NRC generally requires monitoring for all private wells within 2 km of a wellfield for one year before operations and quarterly during operations for constituents listed in Regulatory Guide 4.14. This sampling is necessary to provide NRC with the background water quality and operational water quality in private wells to ensure that they are not being contaminated by wellfield operations.

Formulation of RAI

Uranium One should provide a commitment to sample all private wells within 2 km of the proposed wellfields at all satellites quarterly for one year before operations and quarterly during operations for the constituents listed in Regulatory Guide 4.14 and provide these results in the semi-annual environmental and effluent reports submitted to NRC.

RAI 97

Description of Deficiency

The information provided in TR Section 7.2.5 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

In Section 7.2.5.1 Uranium One provided a commitment to monitor the background water levels in selected private domestic and livestock water wells surrounding the project area before extraction begins and every three months during operation. The TR, however, did not specify which wells would be monitored or their location relative to the proposed wellfields at the Leuenberger, North Platte or Peterson Satellites. Staff is concerned that although the geological interpretation provided in Addendum 2.7-F purports that none of the Negley wells are completed in the 80 and 90 ore sands, substantial uncertainty remains, given the heterogeneity

of these and the overlying sands in the Ft. Union and the lack of aquifer pumping tests in and near the Negley Subdivision. The staff cannot therefore conclude that all of the Negley wells are completely isolated from the targeted 80 and 90 ore sands. Staff is also concerned with the lack of characterization of private wells around the North Platte and Peterson Satellites which may be impacted (addressed in a prior RAI). Staff notes that a commitment to measure water levels quarterly in private wells within 2 km of the proposed wellfields at all of the satellites before and during operations would provide reasonable assurance that impacts to private wells from the operations in the targeted ore sands are being detected so they may be evaluated.

Formulation of RAI

Uranium One should provide a commitment to measure water levels quarterly in private wells within 2 km of the proposed wellfields at the Leuenberger, North Platte and Peterson Satellites before and during operations to provide reasonable assurance that the operations in the targeted ore sands are not impacting private wells. Uranium One should commit to provide these water level measurements in the semi-annual environmental and effluent reports submitted to NRC. Uranium One should provide the name, location, screen interval (s) and depths of all wells to be monitored.

RAI 98

Description of Deficiency

The information provided in TR Addendum 2.7-F does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 5.7.8.2 and acceptance criteria in Section 5.7.8.3 of the SRP.

Basis for Request

The TR provided an analysis of the Negley Subdivision private wells and the historical and potential impact of ISR operations at the Leuenberger Satellite on these wells in Addendum 2.7-F. Staff determined that Uranium One had provided the incorrect ground surface elevations for the majority of these wells. Uranium One performed an elevation survey of the wells in early 2012, and provided the values to the NRC. However, not all tables and figures in Addendum 2.7-F and other parts of the application were updated to reflect corrected well ground surface elevations from the survey. Staff used the corrected elevations to re-evaluate the completion intervals and potential safety concerns with operation of the Negley wells; however, this information must be corrected in the application to provide reasonable assurance that all technical information in the application is valid.

Formulation of RAI

Uranium One should update all references, discussions, tables and figures in Addendum 2.7-F and the application to reflect corrected well ground surface elevations of the Negley Subdivision private wells from the early 2012 survey.

RAI 99

Description of Deficiency

Section 5.7.11, Quality Assurance Program, is not consistent with the recommendations in Regulatory Guide 4.15.

Basis for Request

Section 5.7.11 states: "A Quality Assurance (QA) program will be implemented at the proposed Ludeman project consistent with the recommendations contained in Regulatory Guide 4.14 Sections 3 and 6 and Regulatory Guide 4.15 (NRC 1979)." The description of the QA Program in Section 5.7.11 should reference Regulatory Guide 4.15, Rev. 2, 2007. In addition, the description of the QA Program does not include: (1) records management; (2) environmental sampling quality control; (3) quality control for radioactive effluent monitoring system; (4) verification and validation; and (5) corrective actions.

Formulation of RAI

Uranium One should revise Section 5.7.11 of the TR, and all other applicable sections of the TR, to ensure that the discussion of the QA Program is consistent with Regulatory Guide 4.15.

Section 6 - Ground-Water Quality Restoration, Surface Reclamation, and Facility Decommissioning

RAI 100

Description of Deficiency

The information provided in Section 6.1 is incorrect.

Basis of Request

Sections 6.1.2 and 6.1.4.2 incorrectly identify the N sand at the Leuenberger Satellite as the "70" sand. The N sand is equivalent to the 90 sand at the proposed Leuenberger Satellite.

Formulation of RAI

Please correct the error with naming convention for sands at the Leuenberger Satellite in all of Section 6.1.

RAI 101

Description of Deficiency

The information provided in Section 6.1 is incorrect.

Basis of Request

Section 6.1.4 refers to Figures 6-A-1 through 6-A-5 of the Irigaray Report (Cogema, 2004) to show that RO was often continued for several PVs beyond the point that groundwater quality had stabilized. NRC staff notes these figures are not in the Irigaray Restoration Report dated July 2004 or in the application.

Formulation of RAI

Please correct the reference to Figures 6-A-1 through 6-A-5 of the Irigaray Report (Cogema, 2004) in Section 6.1.4. These figures were not found in this report or in the application.

RAI 102

Description of Deficiency

The information provided in Section 6.1 is inconsistent with other sections of the TR.

Basis of Request

Section 6.1.5 provides a discussion of the restoration schedule. It estimates the restoration pore volumes and time for Wellfields 1 and 2 and then addresses Wellfields 3-7. The naming convention in the majority of the application is for Wellfields 1-3 for the Leuenberger Satellite, Wellfields 1-2 for the North Platte Satellite and Wellfields 1-2 for the Peterson Satellite.

Formulation of RAI

Please maintain the naming convention of Wellfields 1-3 for the Leuenberger Satellite, Wellfields 1-2 for the North Platte Satellite and Wellfields 1-2 for the Peterson Satellite throughout the application and in Section 6.1.5 and Figure 6-1.

RAI 103

Description of Deficiency

The information provided in Section 6.1 is incorrect.

Basis of Request

Sections 6.1.6 and 6.1.7 provide a discussion of effectiveness of the restoration techniques and impacts of groundwater restoration. These sections reference the post mining water quality in Section 6.1.2, when it appears the intent was to reference post-restoration water quality (e.g., reference to Table 6.-2).

Formulation of RAI

Please review these Sections 6.1.6 and 6.1.7 and consider a rewrite to improve the discussion and to present a table of post-restoration water quality as was done for post-mining water quality in Section 6.1.2.

RAI 104

Description of Deficiency

The information provided in Section 6.1 is incorrect.

Basis of Request

Section 6.1.7.1 is stated to be a discussion of alternatives for groundwater quality restoration, but is actually a discussion of disposal alternatives for liquid wastes

Formulation of RAI

Please review Section 6.1.7.1 and consider a rewrite to improve the discussion.

RAI 105

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

Uranium One did not provide a commitment to restore the production zone aquifer in all proposed wellfields and any groundwater impacted by excursions to standards in Criterion 5B(5) in Appendix A of 10 CFR Part 40.

Formulation of RAI

Uranium One should provide a commitment to restore the production zone aquifer in all proposed wellfields and any other groundwater impacted by excursions to the standards in Criterion 5B(5) in Appendix A of 10 CFR Part 40.

RAI 106

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

In Section 6.1.4 the TR provides a discussion of estimates of the pore volumes required for complete restoration. However, the TR does not include any description of the methods which will be used to determine a pore volume and its flare factor for the confined aquifer or unconfined aquifers located in the targeted ore zones in the proposed wellfields at the Leuenberger, North Platte or Peterson Satellites. The TR also did not provide initial estimates of the pore volume and flare factors for ore zone aquifers in all the proposed wellfields. Staff requires an estimate of pore volume for each wellfield to review proposed restoration schedules using the estimated restoration/waste disposal rates to provide reasonable assurance that restoration will be conducted safely and in a timely manner.

Formulation of RAI

Uranium One should provide: (1) the methods which will be used to determine a pore volume and its flare factor for the targeted ore zone aquifers at each proposed wellfield; and (2) initial estimates of one pore volume and flare for each of the proposed wellfields for the Leuenberger, North Platte or Peterson Satellites.

RAI 107

Description of Deficiency

The information provided TR Section 6.1.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

TR Section 6.1.8.2 states that Uranium One will perform stability sampling for a restored wellfield at the beginning, middle, and end of a one year stability period. NRC requires at least four consecutive quarterly samples which show no statistically significant increasing trends to establish stability to provide reasonable assurance that the restoration is stable.

Formulation of RAI

Uranium One should provide a commitment to obtain at least four consecutive quarterly samples which show no statistically significant increasing trends to establish stability for each constituent in the restored wellfield.

RAI 108

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not specifically state that the wells used to determine restoration completion and stability in a wellfield would be the same wells used to establish the baseline water quality. This commitment is needed to remove any spatial uncertainty in the comparison of the restored water quality to baseline water quality.

Formulation of RAI

Uranium One should provide a commitment to use the same wells to determine restoration completion and stability in a wellfield as were used to establish the baseline water quality for the wellfield.

RAI 109

Description of Deficiency

The information provided in TR Section 6.1.8 does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

TR Section 6.1.8 describes the monitoring which will be undertaken during restoration. However, it does not provide a commitment to continue excursion monitoring of the wellfield after restoration stability monitoring is completed and until the restoration is approved. This commitment is needed to provide reasonable assurance that excursion monitoring will continue until the wellfield is approved for unrestricted release.

Formulation of RAI

Uranium One should provide a commitment to continue excursion monitoring of the wellfield after restoration stability monitoring is completed and until the restoration is approved.

RAI 110

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not provide a commitment to maintain a hydrologic bleed sufficient to control the migration of process or restoration solutions from the production zone until active restoration is completed. This commitment is needed to have reasonable assurance that hydraulic control of fluids in the wellfield will be maintained until restoration stability is initiated.

Formulation of RAI

Uranium One should provide a commitment to maintain a hydrologic bleed sufficient to control the migration of process or restoration solutions from the production ore zone at all wellfields until active restoration is completed.

RAI 111

Description of Deficiency

The information provided in the TR does not meet the applicable requirements of 10 CFR Part 40 using the review procedures in Section 6.1.2 and acceptance criteria in Section 6.1.3 of the SRP.

Basis of Request

The TR does not provide a commitment to provide NRC with a restoration report for review and approval for each restored wellfield.

Formulation of RAI

Uranium One should provide a commitment to provide NRC with a restoration report for review and approval for each restored wellfield.

RAI 112

Description of Deficiency

TR Section 6.2.4 is not consistent with SRP Acceptance Criteria 6.2.3(4).

Basis for Request

Section 6.2.4 states: "As a result, the pre-operation contours shown on Figure 2.1-1 will generally emulate post-production contour." SRP, Acceptance Criteria 6.2.3(4), requires that the application should include a pre-construction surface contour map and a description of planned surface reclamation activities that will be employed to restore the surface to pre-operations condition. The application includes a pre-operation surface contour map, Figure 2.1-1. However, the map scale does not allow the staff to read the contours and is insufficient to document pre-operation surface contours. In addition, Uranium One should commit to restoring the surface to pre-operation surface contours instead of "restored to a surface configuration that will blend in with the natural terrain, and be consistent with the post mining land use."

Formulation of RAI

Uranium One should revise Section 6.2.4 of the TR, and all other applicable sections of the TR, to ensure that the discussion of final surface contouring is consistent with SRP, Acceptance Criteria 6.2.3(4).

RAI 113

Description of Deficiency

The information provided in TR Section 6.4.3 is not consistent with SRP Section 6.4.3 acceptance criterion (5).

Basis for Request

SRP Section 6.4.3 acceptance criterion (5) states the survey method for verification of soil cleanup is designed to provide 95-percent confidence that the survey units meet the cleanup guidelines. In TR Section 6.4.3, the Uranium One states that the gamma survey method may not provide 95 percent confidence.

10 CFR 40, Appendix A, Criterion 6(6) requires licensees to ensure that radium concentrations in soil averaged over areas of 100 square meters, does not exceed background concentrations by more than 5 pCi/g or, 15 pCi/g averaged over the first 15 cm below the surface. Byproduct

material containing concentrations of radionuclides other than radium in soil, must not result in a TEDE exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are ALARA.

Formulation of RAI

Revise TR Section 6.4.3. to include a survey method for verification of soil cleanup is designed to provide 95-percent confidence that the survey units meet the cleanup requirements in 10 CFR 40, Appendix A, Criterion 6(6).

RAI 114

Description of Deficiency

Section 6.4.3, is not consistent with Sections 6.2.2, and 6.4.2 of the TR.

Basis for Request

Section 6.4.3 states: "Pre-reclamation surveys will also be conducted as described in Section 6.4.2 in areas where known contamination has occurred or the potential for unknown soil contamination exists. Cleanup of surface soils will be restricted to potentially contaminated areas. These potentially contaminated areas include areas where known spills have occurred and areas where there is potential for small unknown spills and other contamination including areas under and around header houses..."

This statement is inconsistent with Section 6.2.2(3) of the TR which states: "A final background gamma survey will be conducted over the entire wellfield area to identify any contaminated earthen materials requiring removal to disposal;"

The statement in Section 6.4.3 is also inconsistent with Section 6.4.2 which states: "Pre-reclamation radiological surveys will be conducted in a manner consistent with the baseline radiological surveys, described in Section 2.9, so that the data can be directly compared for identification of potentially contaminated areas." Section 2.9 does not indicate that baseline radiological surveys will be conducted only "in areas where known contamination has occurred or the potential for unknown soil contamination exists".

Formulation of RAI

Uranium One should revise Section 6.4.3 of the TR, and all other applicable sections of the TR, to ensure that the discussion of pre-reclamation surveys is consistent with survey descriptions provided in Sections 6.2.2(3) and 6.4.2 of the TR.

RAI 115

Description of Deficiency

The TR does not explicitly specify that the cost estimate reflects third-party contractor costs.

Basis of Request

Appendix C of NUREG-1569 states that, "Cost estimates must be calculated on the basis of completion of all activities by a third party (a third party is an independent contractor or operator who is not financially affiliated with the licensee)." The TR does not explicitly specify that the cost estimate reflects third-party contractor costs.

Formulation of RAI

Confirm that cost estimate is based on completion of all decommissioning activities by a third party (Appendix C of NUREG-1569).

RAI 116

Description of Deficiency

Decommissioning costs associated with certain prospective work to be performed at the site are not included in the cost estimate.

Basis of Request

Appendix C of NUREG-1569 states that, "The annual surety estimate must be prospective of all work to be performed at the site. The licensee must provide estimated costs for all decommissioning, reclamation, and ground-water restoration work remaining to be performed at the site."

Page 6-41 of the Ludeman ISR Project TR states that:

"the surety estimate presented in Appendix E was developed for the first year of the project. There will be no wellfield or satellite operations during the first year; therefore, no wellfield groundwater restoration, building or soil decontamination costs were carried through the cost estimate."

Based on this statement, decommissioning costs associated with certain prospective work to be performed at the site are not included in the cost estimate. Per NUREG-1569, the cost estimate must account for all work to be performed at the site, beyond the first year of the project.

Therefore, the licensee should revise or justify the assumption regarding the exclusion of wellfield groundwater restoration, building, and soil decontamination costs, and update the cost estimate as appropriate. Otherwise, the licensee will need to update its surety to capture these costs prior to injecting lixiviant and a license condition will be added to include this requirement.

Formulation of RAI

Revise or justify the assumption regarding the exclusion of wellfield groundwater restoration, building, and soil decontamination costs and update the cost estimate as appropriate.

RAI 117

Description of Deficiency

Decommissioning cost information is incomplete.

Basis of Request

NUREG-1569 states that "Unit costs, calculations, references, assumptions, equipment and operator efficiencies, et cetera, must be provided."

Uranium One presents unit cost data, calculations, references, and assumptions in a series of eighteen worksheets. In many cases, these worksheets do not provide sufficient detail for the following unit cost data, calculations, references, and assumptions. Sufficient detail would include information that clearly demonstrates the source of the cost (e.g., Bureau of Labor Statistics data, quote/contract):

Worksheet 1, No. II and III, Groundwater Restoration

- The unit cost of sulfuric acid, caustic soda, hydrochloric acid, hydrochloric sulfide, repair and maintenance, sampling and analysis, RO Antiscalent, WDW Antiscalent, corrosion inhibitor, and algacide are based on “Costs from operating ISR facility experience (Cogema).” In order to fully evaluate and compare these costs, the staff requests additional information on the relevance of the facilities for which the costs are based. What are the name and locations of these facilities?
- The unit cost for repair and maintenance is used three times in this worksheet. In its first occurrence, the unit cost value is \$0.279 (\$/Kgal), the second is \$0.016 (\$/Kgal), and the third is \$0.23 (\$/Kgal). Please clarify why different unit cost estimates are used for repair and maintenance in this worksheet.
- The unit cost for sulfuric acid is used two times in this worksheet. In its first occurrence, the unit cost value is \$0.076 (\$/Kgal), while the second is \$0.28 (\$/Kgal). Please clarify why different unit cost estimates are used for sulfuric acid.

Worksheet 1, No. IV and V, Groundwater Restoration

- The submittal does not document the source of the cost assumptions for labor. Please provide a basis for the labor cost assumptions used in the estimate.

Worksheet 1, No. VI, VII and Summary

- The Total Restoration Capital Requirements in No. VI is identified as \$140,000. However, in the Summary, “VI. Capital” is identified as \$75,000 for the North Platte Plant and the Peterson Plant. Please revise the Total Groundwater Restoration Cost to account for \$140,000 in capital costs for the North Platte and Peterson Plants.

Worksheet 2b, Satellite Plant Building Demolition and Disposal

- The submittal does not document the source of the cost assumptions for the unit cost of demolition, transportation unit cost (ton-mile), structure disposal cost (\$/ton), decontamination (\$/ft²), and demolition (\$/ft²). Please provide a basis for these unit cost assumptions used in the estimate.

Worksheet 3, Soil Removal and Disposal

- The submittal does not document the source of the cost assumption for the soil disposal fee (\$/ton). Please provide a basis for this unit cost assumption used in the estimate.

- The cost estimate does not include any costs associated with radiation surveys. Please revise or justify the basis for this assumption.

Worksheet 5, No. I, Wellfield Equipment Removal and Disposal

- The submittal does not document the source of the cost assumptions for the disposal fee per Yd³. Please provide a basis for this unit cost assumption used in the estimate.

Worksheet 5, No. II, Wellfield Equipment Removal and Disposal

- The submittal does not document the source of the cost assumptions for the cost of removal of pump and tubing (\$/well), cost for decontamination (\$/load), and cost of removal of chipped volume (\$/ft). Please provide a basis for these unit cost assumptions used in the estimate.

Worksheet 5, No. III, Wellfield Equipment Removal and Disposal

- The submittal does not document the source of the cost assumptions for the pipeline removal unit cost (\$/ft of trench). Please provide a basis for this unit cost assumption used in the estimate.

Worksheet 6, No. II, III, IV, and V, Topsoil Replacement and Revegetation

- The unit cost for radiation survey and soil analysis (\$/ac) is used four times in this worksheet. The unit cost value is referenced twice as \$1,200 (\$/ac), and twice as \$800 (\$/ac). Please clarify why different unit cost estimates are used for radiation survey and soil analysis, and provide a basis for the unit cost assumptions.

Worksheet 7, Nos. I-VII, Miscellaneous Reclamation

- The submittal does not document the source of the cost assumptions for the cost of fence removal/disposal (\$/ft) and the cost of powerline removal and disposal (\$/ft). Please provide a basis for these unit cost assumptions used in the estimate.

Worksheet 8, Nos. I-VIII, Pond Reclamation Cost

The submittal does not document the source of the cost assumptions for the sludge handling cost per load (\$/load), transportation cost per truckload, labor crew cost per hour (\$/hour), and liner handling cost per load (\$/load). Provide a basis for these unit cost assumptions used in the estimate

Formulation of RAI

Revise or justify unit costs, calculations, references, and assumptions.

RAI 118

Description of Deficiency

The cost estimate does not appear to include sufficient labor overhead, contractor profit,

and contingency.

Basis of Request

NUREG-1569 states the following:

“Overhead costs for labor and equipment and contractor profit may be calculated as separate items or loaded into hourly rates. If included in hourly rates, the unit costs must identify the percentages applied for each area....All costs (unit and total) are to be estimated on the basis of third party, independent contractor costs (include overhead and profit in unit costs or as a percentage of the total).”

NUREG-1569 also addresses the use of a contingency factor by stating:

“The licensee should include a contingency amount to the total cost estimate for the final site closure. The staff considers a 15-percent contingency to be an acceptable minimum amount.”

The “Restoration and Reclamation Cost Estimates at the End of Year 1” worksheet, which contains the restoration cost (i.e., the total decommissioning cost estimate), includes a line for “Administration, Overhead and Contingency (25%),” which is applied and added to the cost estimate subtotal. By grouping administration, overhead and contingency together, it is difficult to evaluate the sufficiency of the amount included for overhead, contractor profit, and contingency (minimum 15 percent).

The term “overhead” includes those costs that are not directly traceable to any particular product produced or project conducted by the firm. Overhead typically includes “period costs” such as, for example, insurance, utilities, rent, supplies, property taxes, and depreciation, as well as the costs of any wages, salaries, and benefits incurred as a result of the corporation’s officers and support staff (e.g., accounting staff, legal staff, janitorial staff, security staff). These costs also are commonly considered “administrative” costs.

Unless overhead costs, contractor profit, and a contingency of at least 15 percent are fully included, the cost estimate does not account for the full cost of decommissioning. In this case, the labor cost in the estimate would be lower than what a third party would require to decommission the site.

Formulation of RAI

Revise or justify the decommissioning cost estimate as necessary to reflect all overhead costs, contractor profit, and contingency. Please separate these into two separate line items, one line item for Administration and Overhead and another line item for Contingency in order to more clearly show the dollar amount that is attributed to each of these costs.

Section 7 – Environmental Effects

RAIs included under the Environmental Review

Section 8 – Alternatives

RAIs included under the Environmental Review

Section 9 – Cost-Benefit Analysis

RAIs included under the Environmental Review

Section 10 – Environmental Approval and Consultations
RAIs included under the Environmental Review