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Ross ISR Project

Mine Unit 1 Wellfield Data Package

July 2015

Wyoming Department of Environmental Quality/Land Quality Division
Permit to Mine No. 802

U.S. Nuclear Regulatory Commission Source and Byproduct Materials
License No. SUA-1601

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1.0 INTRODUCTION

1.1 Project Location and Background

The Ross ISR Project is a uranium in-situ recovery (ISR) mine located in Crook County, Wyoming, approximately 20 miles north of the town of Moorcroft (see Figure 1-1 at the end of Section 1.0). Strata Energy, Inc. (Strata) is developing Mine Unit 1 (MU1) in Sections 7 and 18 of T53N, R67W, within the northeastern portion of the Ross ISR Project permit area. Figure 1-2 depicts the location of MU1, and Figure 1-3 shows the monitor well locations, the proposed wellfield pattern layout, and associated infrastructure within MU1.

ISR operations in MU1 are regulated under Strata's source and byproduct materials license SUA-1601 and Wyoming Department of Environmental Quality, Land Quality Division (WDEQ/LQD) Permit to Mine No. 802. The information presented in this wellfield data package for MU1 demonstrates compliance with license conditions (LC) 10.5, 10.6, 10.7, 10.12, 10.13, 11.3, 11.4 and 11.5 of SUA-1601 and is provided for review and verification by NRC staff. This wellfield data package also addresses information required by Permit to Mine No. 802, Mine Plan Sections 4.1 through 4.3 and Reclamation Plan Section 1.1. The MU1 area depicted on Figure 1-2 is within the wellfield area identified on Mine Plan Exhibit MP.2-2 as approved by WDEQ/LQD.

The MU1 wellfield pattern area will cover approximately 35 acres when completed. The area within the perimeter monitor well ring is approximately 87 acres. A total of 72 baseline and monitor wells have been installed in MU1, including: 19 perimeter monitor (PM) wells, 14 overlying monitor (SM) wells, 14 underlying monitor (DM) wells, and 25 ore zone baseline (OZ) wells. In order to meet the requirements of Permit to Mine No. 802 and SUA-1601, 53 of these monitor wells (all except PM wells) were installed within the MU1 wellfield pattern area. Overlying (SM) and underlying (DM) monitor wells were installed at a density of at least one well for every 4 acres of pattern area. Ore zone

baseline wells were installed at a density of at least one well for every 2 acres of pattern area.

1.2 Aquifer Exemption

The MU1 perimeter monitor well ring falls within the area of the OZ aquifer that was previously reclassified and exempted by the U.S. Environmental Protection Agency (EPA), Region 8, via letter to the WDEQ/Water Quality Division (WDEQ/WQD) dated May 15, 2013. Portions of the Lower Lance Formation and Fox Hills Formation containing uranium ores and collectively referred to as the OZ aquifer have been exempted from protections provided by the Safe Drinking Water Act. Figure 1-2 depicts the aquifer exemption area and the MU1 perimeter monitor well ring.

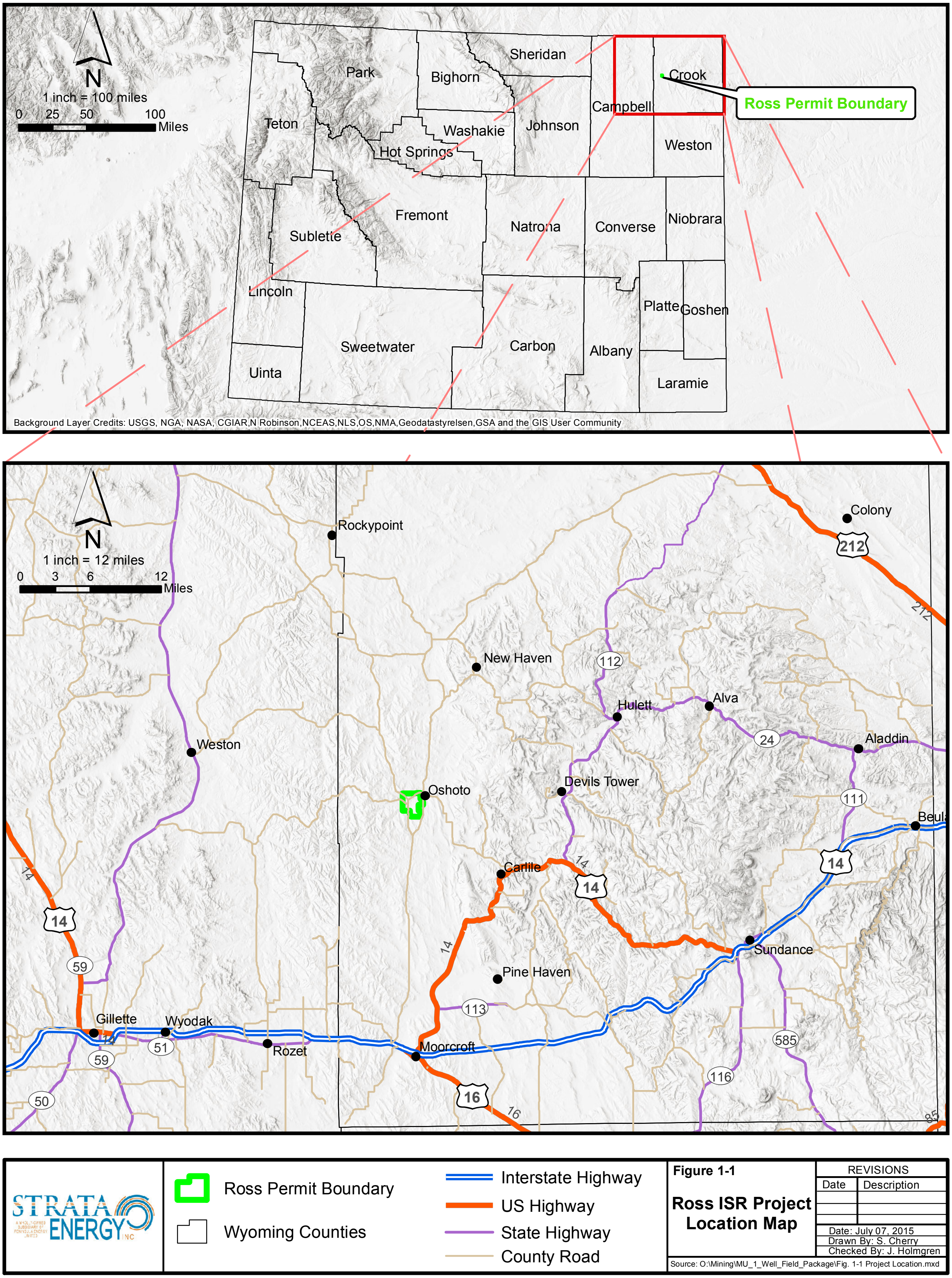
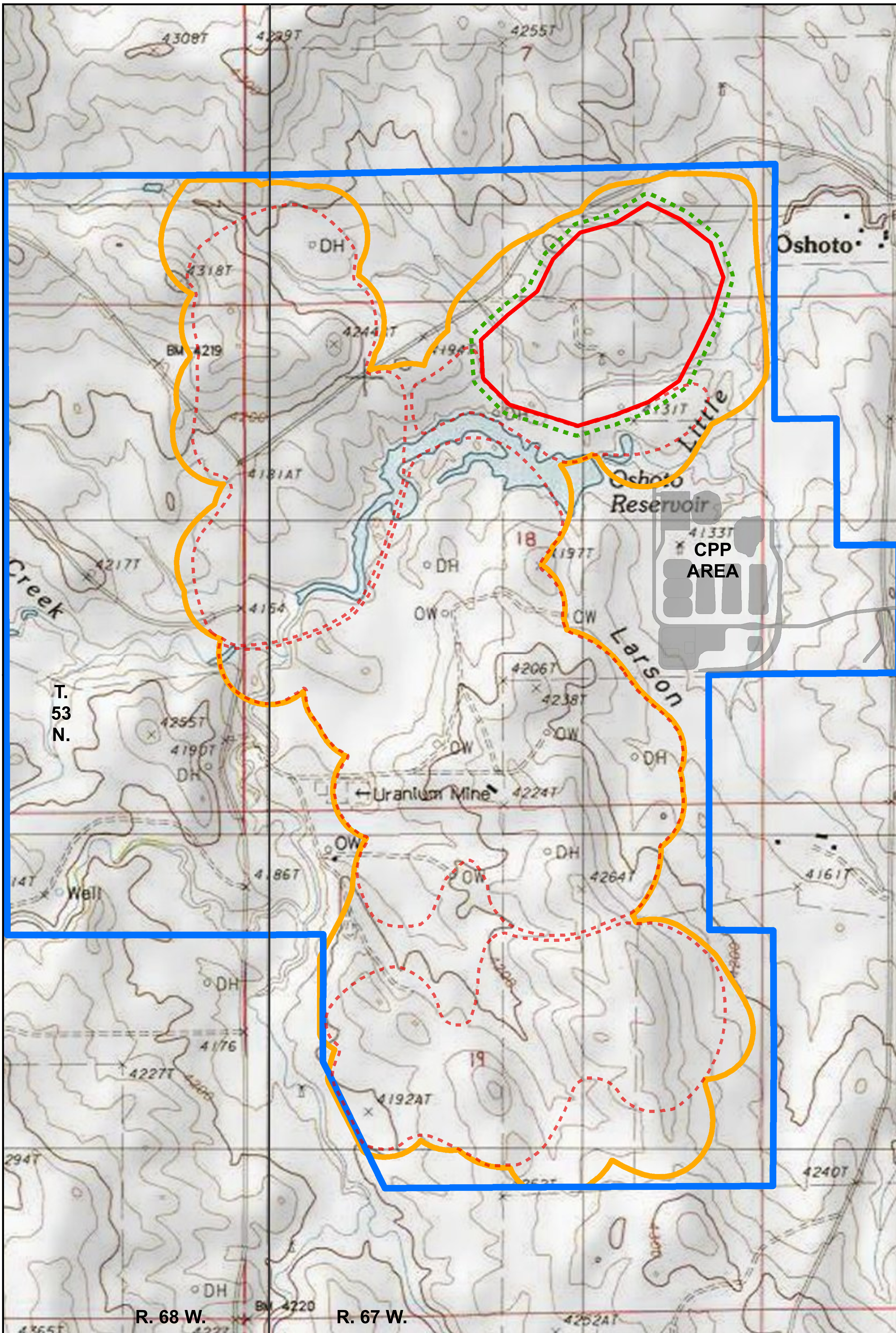


Figure 1-1

Ross ISR Project Location Map



Legend
- Mine Unit 1 Boundary
- Science Based Exemption 100ft Buffer
- Potential Future Mine Units
- Approved Aquifer Exemption Boundary
- Ross Permit Area

N

0 500 1,000 Feet

1 inch = 1,000 Feet

Figure 1-2

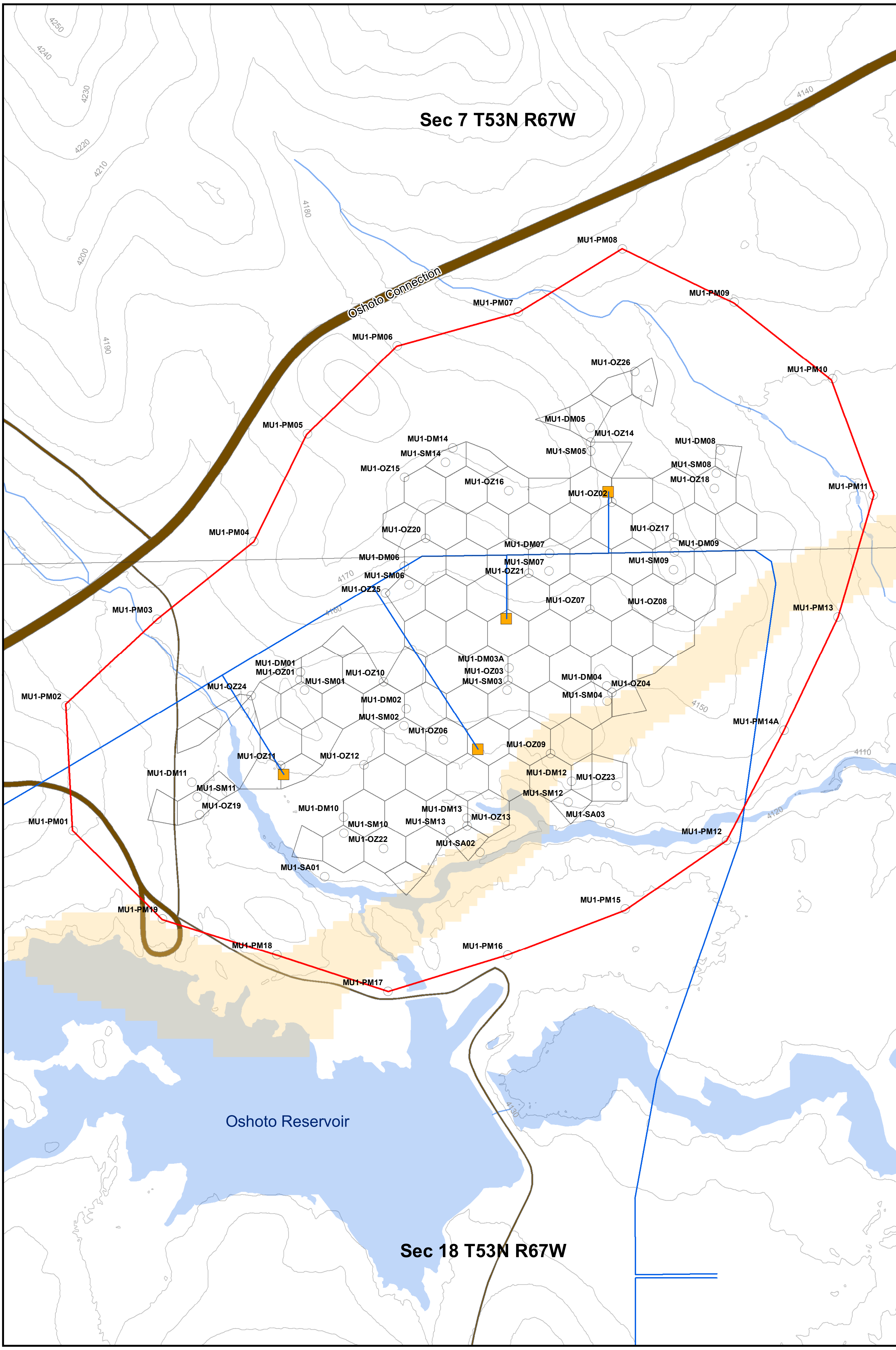
Mine Unit 1: Ross Permit Area Overview

REVISIONS	
Date	Description

Drawn: July 15, 2015

Drawn By: DL
Checked By: JCH

Source: O:\Mining\MU_1_Well_Field_Package\MU1_RPARelation2.mxd



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Legend

- Installed Monitor Wells
- Module Buildings
- Proposed Trunk Lines
- Mine Unit 1 Hexagons
- Low Permeability Area
- Mine Unit 1 Boundary

N

0 100 200 300 Feet

1 inch = 300 Feet

Figure 1-3

Mine Unit 1: Existing And Planned Facilities

REVISIONS	
Date	Description

Drawn: July 13, 2015

Drawn By: DL
Checked By: JCH

Source: O:\Mining\MU_1_Well_Field_Package\MU1_Facilities1.mxd

2.0 HYDROGEOLOGIC CONDITIONS

2.1 Hydrostratigraphy

The Ross permit area is situated on the Lance Formation outcrop. Underlying the Lance Formation is the Fox Hills Formation and the Pierre Shale. The Pierre Shale is a thick marine shale that yields very little water and is considered regionally as a confining unit. Table 2-1 provides the generalized hydrostratigraphy within the MU1 area, and Figure 2-1 provides the stratigraphic column for the mine unit.

The Fox Hills Formation is a sequence of marginal marine to estuarine sediments deposited during the eastward regression of the Upper Cretaceous Sea. In the Ross permit area, the Fox Hills Formation consists of an upper and a lower unit separated by 30 to 50 feet of intervening shale. The lower unit consists of offshore marine and transitional-marine shale, siltstone, and fine grained sandstone and is not known to contain uranium. The lower unit contains two potential water bearing silty-sand zones referred to as “BFS 1 & BFS 2.” BFS 1 is the lowermost unit of the lower Fox Hills Formation and overlies the Pierre Shale. The BFS 2 interval is the upper sandy member of the lower Fox Hills Formation and is separated from the BFS 1 interval by the BFH 1 shale. The BFS 2 interval is the first underlying sandy zone below the OZ aquifer and is the DM interval in MU1. Based on drill cuttings and resistivity characteristics of e-logs, the BFS 2 interval appears to have more cementation than overlying sands and is comprised of abundant silt with very fine grain sand. Due to abundant silt, the fine grained nature of the sands, and cementation, the BFS 2 interval yields little water. Information collected and presented herein does not indicate that the DM interval provides useable quantities of water and is not an aquifer by most definitions. Furthermore, the next water bearing interval is greater than 50 feet below the base of the OZ aquifer.

Overlying the BFS 2 interval is the BFH 2 shale, which is the lower confining unit of the OZ aquifer. The upper unit of the Fox Hills Formation consists of a uranium bearing, organic, thinly-bedded claystone, siltstone, and sandstone referred to as "FH" sand. The depositional environment of the FH sand generally consists of upward fining, near shore fluvial sands. The sands vary from thick-bedded, blocky sandstones to thin interbedded sandstones, siltstones, and shales. Within MU1, mineralization primarily occurs within the upper Fox Hills FH sandstone.

The Lance Formation depositional environment has been interpreted as being fluvio-deltaic in origin. The Lance Formation consists of a mixture of non-marine sandstones and floodplain mudstones, with thin beds of coal. At the base of the Lance Formation are uranium bearing sands referred to as "LL 1 & LL 2," which are separated by interbedded shales. The LL 1 and LL 2 sands average 100 feet in total thickness. Above the uranium bearing sands is a shale layer designated "LC" which varies in thickness from 10 to 60 feet. This shale serves as the confining unit that separates the OZ sands from the water bearing sand above, called the "MLS." The MLS layer is the first water bearing sand above the OZ and is the SM zone. Above the MLS sand is a sequence of thin sands, shales, and silts. Attachment 1 provides geologic cross sections, isopach maps of the SM aquifer, LC shale, OZ aquifer, BFH 2 shale and DM interval, along with structure contour maps of the top and bottom of the OZ aquifer.

2.1.1 Ore Zone

The OZ aquifer is comprised of the upper Fox Hills Formation "FH" and the overlying basal Lance Formation "LL 1 & LL 2" sands. The Fox Hills Formation is a marginal marine sandstone and shale. The FH sand varies from thick-bedded, blocky sandstones, to thin interbedded sandstones, siltstones, and shales. The Lance formation is fluvio-deltaic in origin. The LL 1 & LL 2 sands are non-marine sandstone interbedded with floodplain mudstones. The

OZ aquifer consists of very fine to fine-grained, well-rounded, and well-sorted sandstone. The OZ aquifer is confined by overlying and underlying shales. The overlying LC shale varies in thickness from 10 to 60 feet in MU1. The underlying BFH 2 shale is 30 to 50 feet thick.

2.1.1.1 Evaluation of Potential Heterogeneity

The OZ aquifer is relatively consistent throughout MU1 but does contain minor lithological variations including grain size, silt content, and cementation. There are also several spatially limited interbedded shales with variable thicknesses and continuity in MU1, designated as the W, X, and Y shales. In a small area of the southeastern portion of MU1, sands within the OZ are thinning and the interbedded W, X, and Y shales are thickening. The thinner, more silty sandstones and thicker shales result in an area of generally lower permeability along the southeastern edge of the MU1 wellfield patterns.

The area of lower permeability in the southeastern portion of MU1 is apparent in Strata's aquifer tests performed in May 2015 (detailed analysis included as Attachment 5). The first aquifer test, in which the pumping well was near the center of the mine unit, demonstrated good communication with all OZ baseline and perimeter monitor wells except those wells in the southeastern portion of MU1. During the second aquifer test, with the pumping well in the southeastern portion of MU1, drawdowns observed in all perimeter monitor wells to the southeast showed good communication. However, only muted responses were observed within the OZ monitor wells to the west. This is likely due to two separate channel systems within the ore zone sandstone locally isolated by floodplain mudstones and thinner, lower permeability sands. The cross sections of MU1 depict a thickening of shales and thinning of sands along the southeastern portion of MU1.

Aside from the low permeability channel systems identified near the southeastern edge of the wellfield, the hydraulic parameters are consistent across the remainder of the MU1 wellfield area. As noted in Attachment 5,

drawdowns from 37 PM and OZ wells were evaluated northwest of the low permeability channel system. The average hydraulic conductivity for this portion of the wellfield was 0.65 ft/day, with values calculated at each individual well ranging from approximately 0.5 to 0.9 ft/day. Given the large number of wells evaluated and the relatively similar hydraulic conductivity values observed throughout the wellfield, the majority of the wellfield is relatively homogeneous outside of the influence of the low permeability channel system. Similarly, southeast of the low permeability area the OZ aquifer is relatively homogeneous with calculated hydraulic conductivities at the six PM wells ranging from approximately 0.2 to 0.4 ft/day and averaging 0.34 ft/day.

2.1.2 Overlying Units

Overlying the OZ aquifer is the LC shale, which acts as the confining layer between the OZ and the SM aquifers. The LC shale varies in thickness from 10 to 60 feet in MU1 and is continuous throughout the mine unit. The MLS sand represents the first overlying aquifer above the OZ and is the SM zone. The MLS sand is a water bearing sand that ranges from 30 to 80 feet thick in MU1 and is continuous throughout the mine unit.

2.1.3 Surficial Aquifer

Within the Ross permit area alluvial deposits occur along the main channels of the Little Missouri River and Deadman Creek. Based on geotechnical drilling directed by WWC Engineering in May 2010, the alluvium, where present, ranges in thickness from approximately 1 to 20 feet. The alluvium is recharged by seasonal flow events as both Deadman Creek and the Little Missouri River are ephemeral (flow is in response to rainfall and snowmelt events) within the Ross permit area. Oshoto Reservoir is just south of MU1 and provides a source of recharge to the quaternary alluvium mapped by the United States Geological Survey (USGS) and depicted in Appendix D5 of Permit to Mine No. 802 and the Technical Report, Figure 2.6-4. The reservoir likely regulates the water level within the alluvium by trapping seasonal runoff

and discharging into the alluvium when water levels decrease. Three SA monitor wells have been installed between the wellfield pattern area and the nearest surface water feature within the perimeter monitor well ring. Depth to bedrock ranged from 8 to 13 feet in the three wells. The alluvial material within the Little Missouri River tributary along the southern edge of MU1 was mapped by Strata and is depicted on Figure 2-5.

2.1.4 Underlying Units

Underlying the OZ aquifer is the BFH 2 shale, which acts as the confining layer between the OZ and the DM interval. The BFH 2 shale varies in thickness from 30 to 50 feet in MU1 and is continuous throughout the mine unit. The BFS 2 sand represents the first underlying sand beneath the OZ and is the DM interval. The BFS 2 sand ranges from 10 to 20 feet thick in MU1 and is continuous throughout the mine unit. The BFS 2 sand is a very low yielding zone with yields typically less than 0.1 gallon per minute (gpm) in the DM wells within MU1 (refer to Attachment 5). The next water bearing interval below the BFS 2 sand is greater than 50 feet from the base of the OZ aquifer.

As discussed in Attachment 5, analysis of the recharge following swabbing in the DM wells suggests that there are not useable quantities of water in this zone within the boundaries of MU1. Calculated DM well yields based on measured hydraulic conductivities at each well range from 0.02 to 0.12 gpm and averaged 0.06 gpm. Based on WDEQ/LQD Guideline 8 and WDEQ/WQD Rules and Regulations, Chapter 8, an "aquifer" is defined as "a zone, stratum, or group of strata that stores and transmits water in sufficient quantities for a specific use." Since stock watering is the predominant use of groundwater in the area and the minimum yield to sustain a typical stock watering system ranges from 2 to 5 gpm, the DM interval does not appear to meet State of Wyoming definitions (in guidance or regulation) for an aquifer. Similarly, EPA's definition of "limited use groundwater" in 40 CFR Part 192.11(e) includes groundwater with a quantity of water reasonably available

for sustained continuous use of less than 150 gallons per day (0.1 gpm). Finally, the EPA provides guidance on the definition of an Underground Source of Drinking Water (USDW) in the document "Technical Program Overview: Underground Injection Control Regulations" (EPA, 2002). The guidance states that "[f]or the purpose of defining a USDW, the Office of Ground Water and Drinking Water uses 1 gpm as the threshold value for determining if an aquifer produces a significant amount of water." Based on these definitions and the technical support provided in Attachment 5, Strata concludes that the DM interval in MU1 does not meet the specific criteria to be defined as an aquifer or USDW by multiple state and federal agencies. Since the interval is not an aquifer or USDW, Strata will seek to amend SUA-1601 and revise Permit to Mine No. 802 in order to allow more flexibility in assessing and eventually monitoring the underlying interval in the excursion monitoring program. Until the license is amended and the permit revised, Strata commits to twice monthly (semi-monthly) operational excursion monitoring of the DM interval consistent with LC 11.5 and Mine Plan Section 5.9.1. Following license amendment and permit revision approvals, Strata plans to discontinue excursion monitoring in the DM interval and plug and abandon the MU1 DM monitor wells.

2.2 Potentiometric Surfaces and Gradients

Potentiometric surfaces for the OZ aquifer, the SM aquifer, and the DM interval were developed using the maximum measured water levels observed in the wells prior to the aquifer tests conducted in May 2015. The potentiometric surfaces may exhibit lingering effects of sampling and well development conducted at the observation wells prior to collection of the water level measurements and do not necessarily represent static conditions. Attachment 2 includes a summary of the groundwater level/elevation data used to develop the potentiometric surfaces.

The OZ aquifer potentiometric surface is presented in Figure 2-2. The direction of groundwater flow within the OZ aquifer in MU1 is generally from the northeast to the southwest. Anomalous hydrostatic head measurements in several wells were not used during development of the potentiometric surface depicted in Figure 2-2. These measurements are attributed to the fully penetrating completions in the PM wells with locally perched water bearing intervals resulting in slightly higher hydrostatic heads.

The SM aquifer potentiometric surface is presented in Figure 2-3. The direction of groundwater flow within the SM aquifer in MU1 is generally from the north to the south. Four SM monitor wells (MU1-SM10, MU1-SM11, MU1-SM12, and MU1-SM13) are generally located downgradient from the mine unit and on the southern periphery of the pattern area.

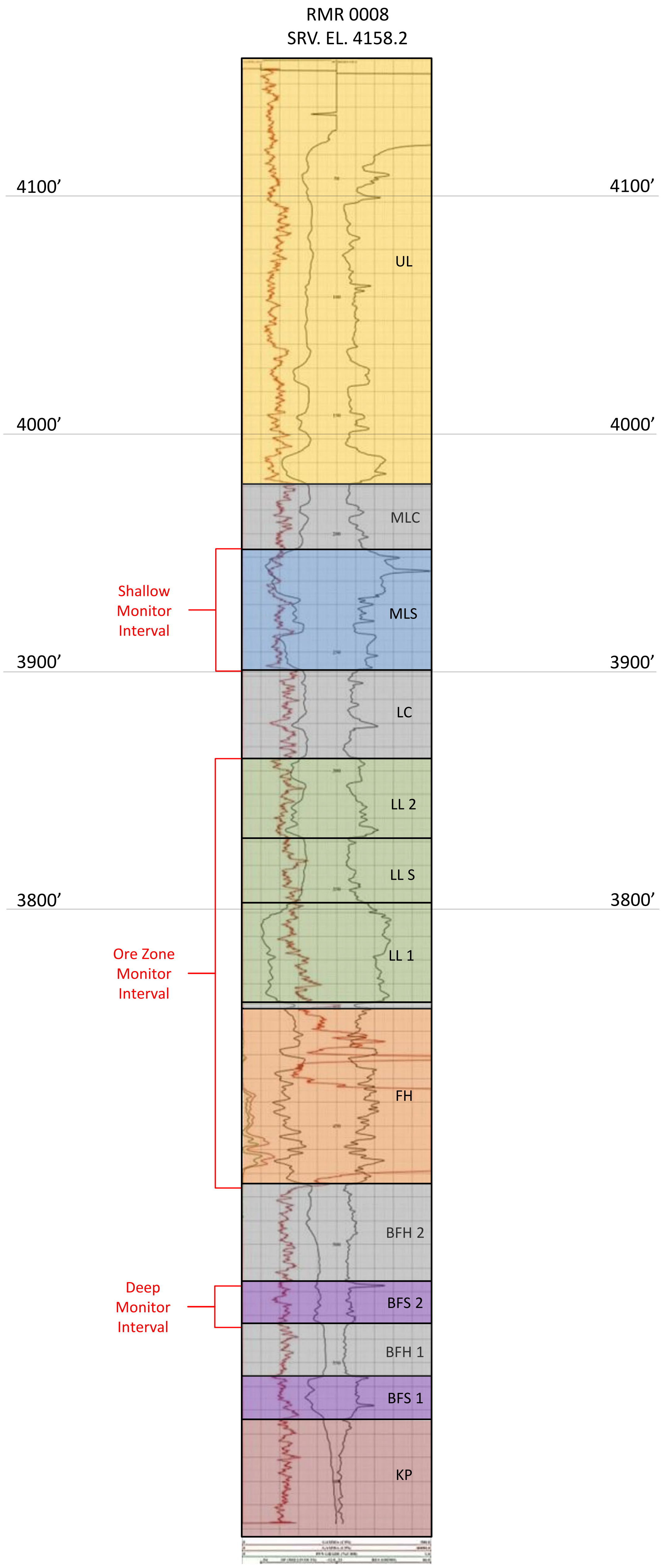
The DM interval potentiometric surface is presented in Figure 2-4. Since the DM interval has very poor water yielding characteristics, it takes weeks to months for the water levels in the DM wells to fully recover. Due to well development and sampling activities, many of the DM wells have not yet recovered to static levels since installation. Therefore, the DM potentiometric water levels provided by most of the DM monitor wells are not static levels and do not reflect the natural flow gradient. The groundwater flow direction in the DM interval is expected to be similar to that in the overlying OZ aquifer based on data presented in the approved permit/license applications and is generally supported by the potentiometry depicted in Figure 2-4. Groundwater flow direction is to the south and southwest with three DM monitor wells (MU1-DM10, MU1-DM11, and MU1-DM13) generally downgradient of the mine unit and on the southern periphery of the wellfield pattern area.

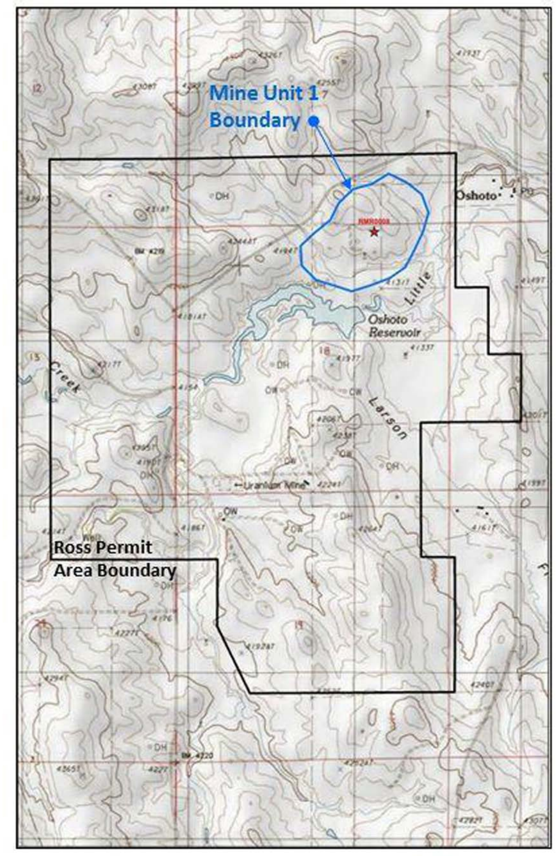
Measured water elevations in the surficial aquifer and corresponding mapped alluvium are depicted in Figure 2-5. In general, water in the SA moves from the highlands to the lowlands to converge on the Little Missouri River valley then as alluvial underflow within quaternary sediments of the SA. In

MU1, flow in the alluvial material moves from west to east with MU1-SA03 the most downgradient of the three SA wells installed to monitor the interval.

Table 2-1. Generalized Hydrostratigraphic Section within MU1

Approximate Depth (ft)	Monitored Zone	Description
0-20	Surficial Aquifer (SA)	Alluvium; variable thickness
20-220		UL; thin sands, shales, and silts
220-270	Shallow Monitor (SM)	MLS; overlying sandstone
270-300		LC Shale; Upper Confining unit
300-400	Ore Zone (OZ)	LL 1 & L L2 sands; Lower Lance sandstone
400-480		FH sand; Upper Fox Hills sandstone
480-520		BFH 2 shale; lower confining unit
520-540	Deep Monitor (DM)	BFS 2 sand; underlying interval
540-560		BFH 1 shale
560-580		BFS 1 sand
580+		Pierre Shale





LEGEND

- UL: UPPER LANCE SANDS ARE FLOODPLAIN DEPOSITS
- MLS: MIDDLE LANCE SANDS ARE FLUVIAL DEPOSITS AND INTERBEDDED CLAYSTONES AND SILTSTONES
- LL1 & LL2: LANCE SANDS ARE FLUVIO-DELTAIC DEPOSITS
- FH: FOX HILLS SANDS ARE MARGINAL MARINE DEPOSITS
- BFS1 & BFS2: BASAL FOX HILLS SANDS ARE MARGINAL MARINE DEPOSITS
- KP: PIERRE SHALE IS A CRETACEOUS MARINE DEPOSITS
- CONFINING SHALES: SHALE-RICH, LOW PERMEABILITY INTERVALS

NOTES:
1. SHALLOW MONITORING INTERVAL: SATURATED SAND INTERVAL OVERLYING AQUITARDS ABOVE THE UPPERMOST MINERALIZATION
2. ORE ZONE INTERVAL: CONTAINING LOWER LANCE/FOX HILLS SANDSTONE ROLL FRONTS
3. DEEP MONITORING INTERVAL: SAND UNIT BENEATH BASAL SHALE CONTACT

STRATA ENERGY INC

ROSS ISR PROJECT
CROOK COUNTY, WY
LICENSE NO. SUA-1601
P.O. BOX 2318, 1900 W WARLOW UNIT A
GILLETTE, WY 82717

REVISIONS	
Date	Description

FIGURE 2-1

STRATIGRAPHIC COLUMN
MINE UNIT 1

Drawn By: DL
Checked By: JH
Date: July 7, 2015

K:\Sheridan\Strata\14143_ACAD_WY83E\DWGS_AQUIFER_TEST\POTENTIOMETRIC_OZ.dwg 7/13/2015 9:49:32 AM condia gonzales

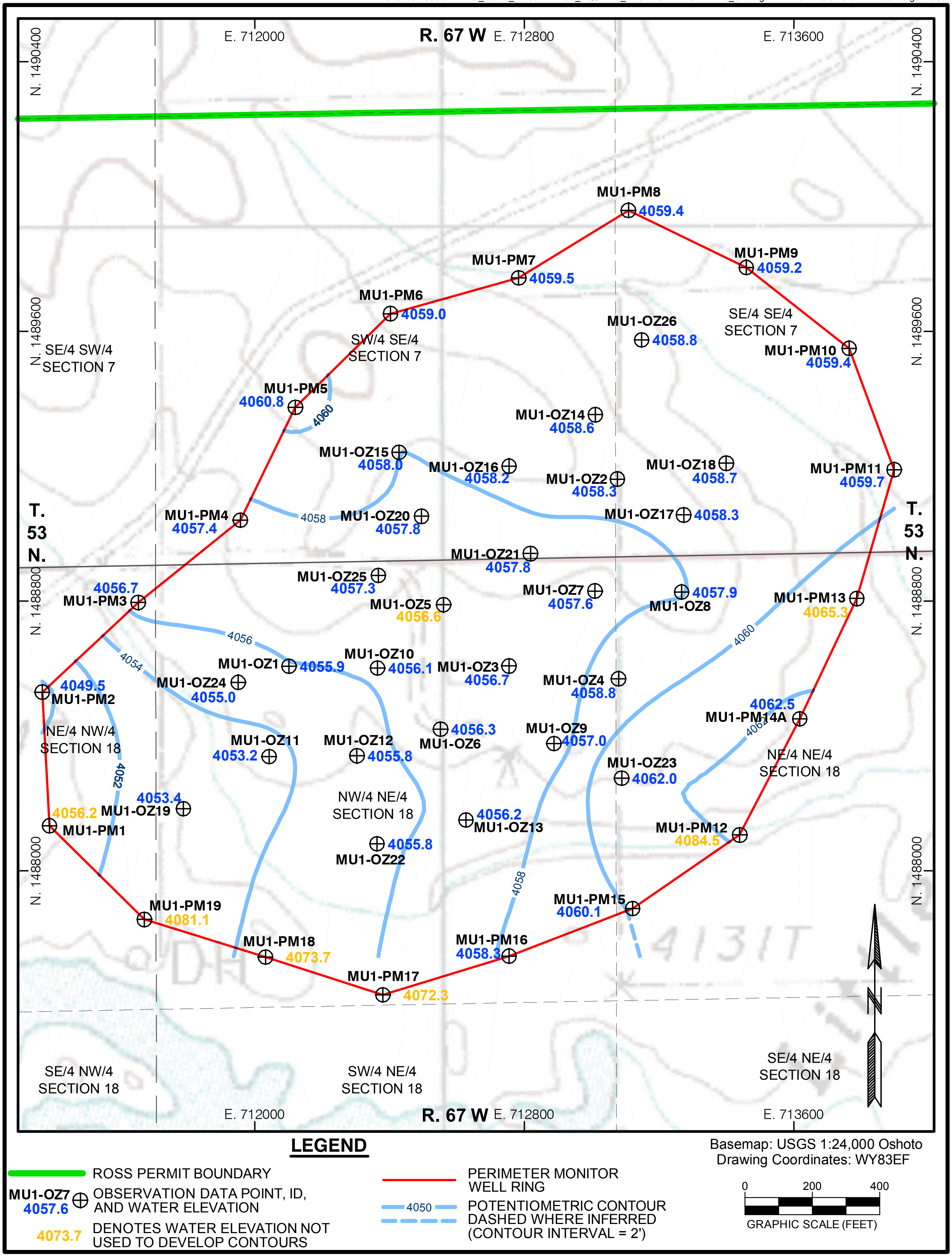


Figure 2-2. Mine Unit 1 OZ Aquifer Potentiometric Contours.

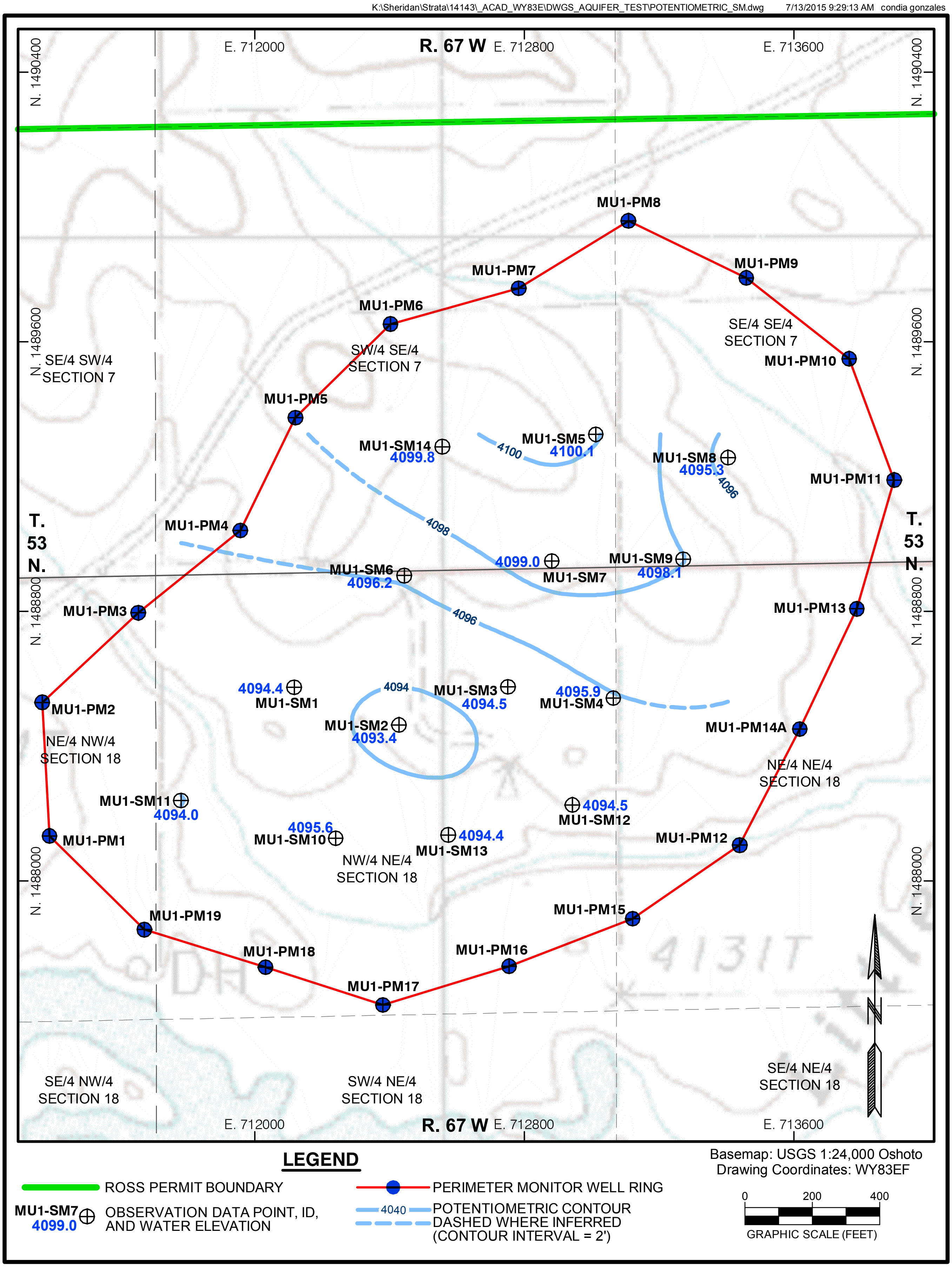


Figure 2-3. Mine Unit 1 SM Aquifer Potentiometric Contours.

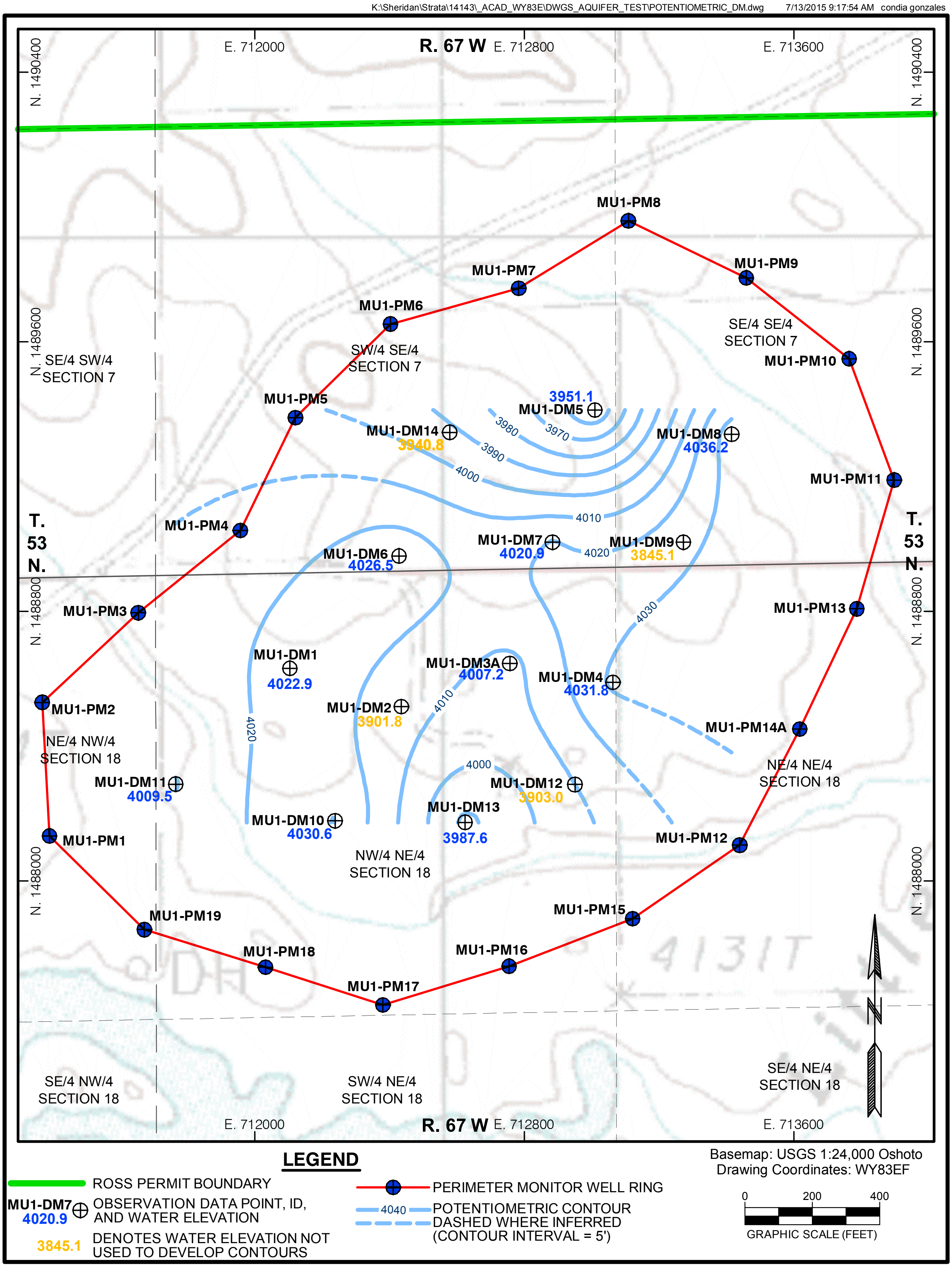


Figure 2-4. Mine Unit 1 DM Interval Potentiometric Contours.

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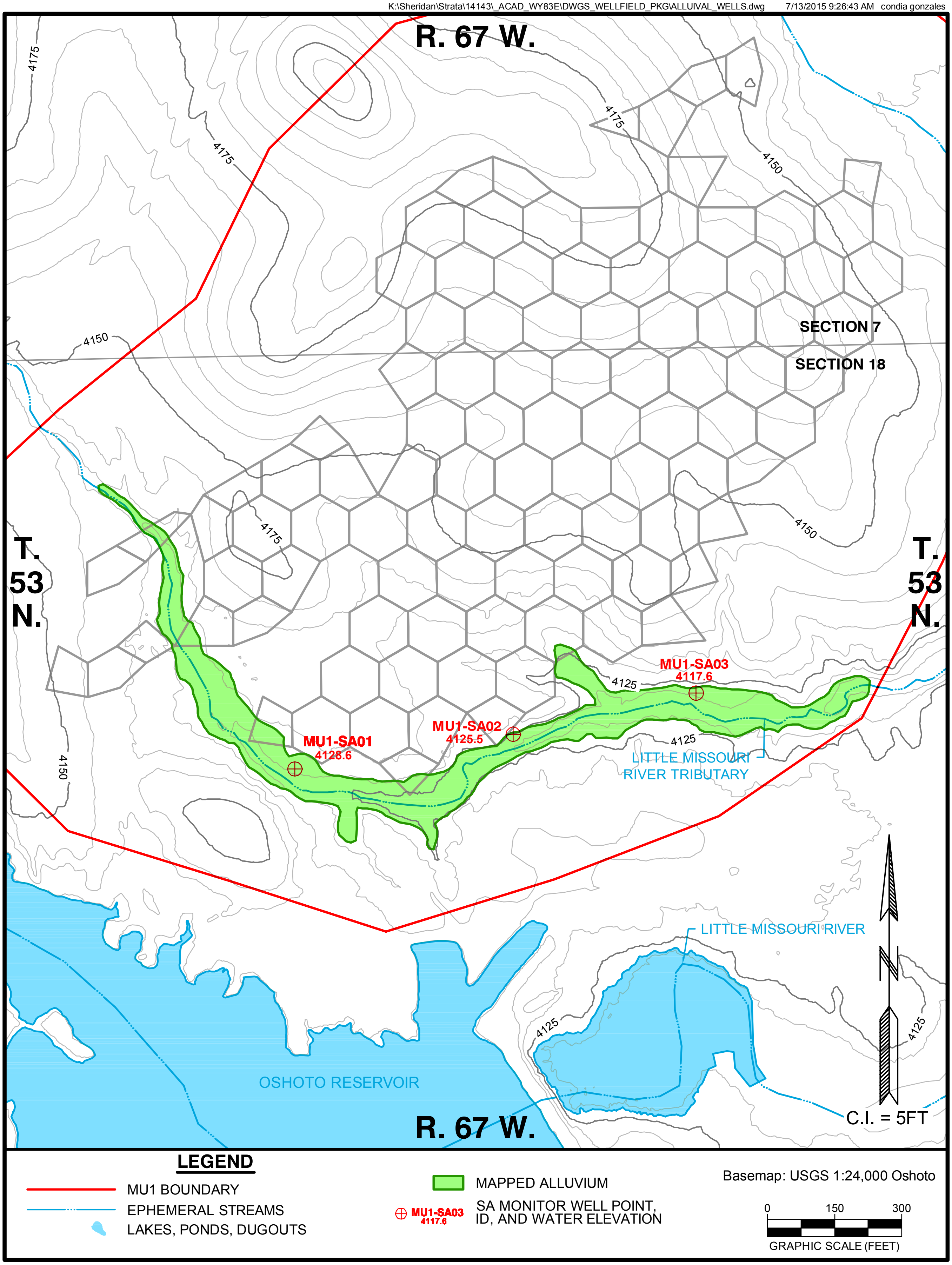


Figure 2-5. SA Monitor Well Locations

3.0 MONITOR WELL SPACING AND COMPLETION

3.1 Well Spacing

MU1 monitor wells are located in accordance with applicable permit and license requirements. The following describes the density, completion methods, and other relevant information regarding the monitor well system constructed within MU1. Figure 3-1 depicts the MU1 monitor well locations.

3.1.1 Ore Zone Baseline Wells

Twenty-five OZ wells were installed to determine pre-operational background water quality and groundwater restoration goals for MU1. This equates to one OZ well for approximately each 1.4 acres of wellfield pattern area, which exceeds the minimum requirement of one well for every 2 acres of wellfield pattern area. OZ well locations are shown in Figure 3-1 and well completion data are presented in Attachment 3, Table 1. OZ wells are completed in the mineralized intervals of the OZ aquifer as determined by geophysical logging. A twenty-sixth OZ well was installed but did not pass mechanical integrity testing. The OZ wells may be used as production or injection wells.

3.1.2 Perimeter Monitor Wells

Nineteen fully penetrating PM wells were installed for lateral excursion monitoring in MU1 during production and groundwater restoration (Figure 3-1). Well completion information for all wells is presented in Table 1 of Attachment 3. PM wells were completed to facilitate the monitoring of waters within the same stratigraphic intervals of the host OZ sandstones in the adjacent production and injection wells within the wellfield. Monitor well spacing is no more than 400 feet from the wellfield pattern area and 400 feet apart.

3.1.3 Overlying Monitor Wells

Overlying monitor wells (SM wells) are required to be installed within the wellfield at a minimum density of one well for every 4 acres of pattern area. Strata installed 14 SM wells, which exceeds this requirement. The SM wells will be used to monitor for potential vertical excursions. SM wells are completed in the first aquifer (the MLS sand) overlying the OZ aquifer and fully penetrate the interval. The MLS sand is geologically separated from the OZ sand by the LC shale.

3.1.4 Surficial Aquifer Monitor Wells

Strata's License SUA-1601 states that for wellfields located in an area in which the uppermost aquifer, the "SA aquifer", is comprised of saturated unconsolidated alluvium, Strata will include monitor wells in the SA in that area of the wellfield as part of the excursion monitoring program. Along the southern boundary of MU1 the uppermost unconsolidated alluvium is saturated due to a tributary to the Little Missouri River that runs parallel to the Little Missouri River and receives water from the Oshoto Reservoir spillway. The tributary confluences with the Little Missouri River about a quarter of a mile downstream of MU1. Three SA wells have been installed in the southern portion of MU1 along the tributary, though out of the active channel. They are positioned along the downgradient side of the SA with relation to MU1, as discussed in Section 2.2. Locations of the wells were selected based on the proximity of mining patterns to the saturated alluvium immediately adjacent to the tributary. The wells were installed at a density of one well per 0.06 acres of wellfield pattern area. The Ross ISR Project Safety Evaluation Report (SER) (pg. 271) describes NRC staff's evaluation of a minimum density of one SA well per 4 acres for the SA (NRC, 2014). The actual density of SA wells is therefore significantly greater than that evaluated in the SER. The wells are distributed at a spacing of 420 to 500 feet along the tributary. The spacing and density of the wells is consistent with license requirements and the SER evaluation to

provide early detection of a release in the event of a pipeline leak or shallow integrity failure in an injection well.

3.1.5 Underlying Monitor Wells

Underlying monitor wells (DM wells) are required to be installed within the wellfield at a density of at least one well for every 4 acres of pattern area. The 14 DM wells more than meet this requirement. The DM wells are completed in the first sandstone located below the OZ aquifer, which is the BFS 2 sand. The BFS 2 sand is geologically separated from the OZ sand by the BFH 2 shale.

3.2 Well Installation and Completion

The monitor wells were drilled and completed consistent with Stata's permit/license requirements. Well installation and completion details for each well are summarized in Attachment 3, Table 1. The monitor wells were constructed with 4.5-inch or 5-inch PVC casing. The completions in the DM, PM, and SM wells fully penetrate their respective sand zones. The OZ baseline wells were screened through the portion of the OZ that will be mined in that particular area. The wells were developed using standard water well construction techniques, such as pumping, airlifting, and/or swabbing. Figures 3-2a through 3-2e depict typical construction details for each type of monitor well (SM, OZ, PM, DM, and SA) constructed.

3.3 Mechanical Integrity Testing (MIT) Records

All monitor wells were mechanically tested for integrity prior to the completion of this wellfield package as required by the applicable permit/license requirements. All the monitor wells used to develop the MU1 hydraulic and water quality data passed MIT. The only exception is MU1-OZ05, which did not pass MIT. Details of monitor well MIT can be found in Attachment 4, Table 1. MIT records for all wells will be kept on-site for

inspection with a summary provided in quarterly and semi-annual reports as appropriate.

3.4 Abandonment of Existing Drill Holes/Wells

Prior to conducting hydrologic test work in MU1, extensive efforts were undertaken to locate and plug historic drill holes within the MU1 perimeter monitor well ring. This included plugging and abandoning 100% of Strata drilled delineation holes and wells. In addition, 89% of Nubeth exploration drill holes were located, plugged and re-abandoned within the perimeter monitor well ring. There were several historic exploration drill holes within drainages or in areas where the ground was disturbed post-Nubeth that were not locatable. Similarly, historic exploration drill holes within cultural sites were not accessible to a drill rig. Nevertheless, the validity of the abandonment work is demonstrated by Strata's efforts to locate and re-abandon the vast majority of the historic drill holes and through the virtual lack of communication of the SM and DM intervals with the OZ aquifer. A summary of the historic drill hole abandonment efforts for MU1 is provided in Table 3-1. A tabulation of all exploration and delineation drill hole abandonment for MU1 is provided in Attachment 4, Table 2. Figure 3-3 provides the locations of Strata and Nubeth drill holes, and indicates the status of the re-abandonment of the drill holes.

Materials license SUA-1601 was amended on June 23, 2015 to reflect the Atomic Safety and Licensing Board (ASLB) initial decision in LBP-15-3. The amended LC 10.12 required an expanded area to locate and abandon historic drill holes that penetrate the underlying aquifer to either the license boundary or aquifer exemption boundary (whichever is closer) in the downgradient direction. Strata concluded that the intent of the ASLB Order was to prevent the potential future migration of contaminants into the DM interval a specified distance beyond the perimeter monitor well ring in the downgradient direction. In other words, after groundwater restoration is concluded and along with it the requirement to maintain a net inward hydraulic gradient, the concern is

that any elevated constituent concentrations in the production zone (i.e. associated with an approved alternate concentration limit [ACL]) could be carried downgradient in the OZ aquifer and eventually affect the DM interval if there is an unplugged or improperly plugged historic drill hole beyond the perimeter monitor well ring. To address this concern, the ASLB Order and ensuing license amendment require Strata to attempt to locate and re-abandon downgradient historic drill holes that penetrate into the DM interval and are a specified distance from the perimeter monitor well ring. That distance is the closer of the aquifer exemption boundary or the license boundary; however, in practice, the closer will always be the aquifer exemption boundary, since it lies entirely within the license boundary. The distance from the perimeter monitor well ring to the aquifer exemption boundary was determined to be 100 feet from a site-specific, science-based calculation that considers the worst-case time to detect and retrieve a horizontal excursion. Since the natural groundwater gradient in the OZ aquifer is southwesterly, MU1 is the most upgradient of the planned mine units. Therefore, the maximum approved aquifer exemption boundary for the Ross ISR Project is much farther than 100 feet in the downgradient direction from MU1, since there are additional mine units planned in the downgradient direction, all of which are surrounded by a single, maximum approved aquifer exemption boundary (refer to Figure 1-2, which shows that the distance from the MU1 perimeter monitor well ring to the maximum approved aquifer exemption boundary in the downgradient direction is several thousand feet). In order to meet the intent of the ASLB Order, Strata attempted to locate and abandon all historic drill holes that are downgradient of MU1 and within 100 feet of the MU1 perimeter monitor well ring. This 100-foot buffer distance beyond the perimeter monitor well ring is for all practical purposes the aquifer exemption boundary for MU1. It would be illogical and impractical instead to attempt to locate all historic drill holes penetrating the DM interval that are farther away (i.e., within several thousand feet downgradient to the maximum approved aquifer exemption boundary), since those drill holes eventually will be within or downgradient of other planned

mine units and will be subject to the provisions of LC 10.12 as those mine units are developed.

The language in EPA's aquifer exemption approval letter dated May 15, 2013, describes the aquifer exemption boundary as follows: "It is horizontally described by the monitor well ring plus an additional 100 feet beyond the monitor well ring as shown by Map D12-1 accompanying WDEQ's aquifer exemption request." The aquifer exemption boundary in the map submitted to EPA was based on areas of known and suspected mineralization and not on an actual perimeter monitor well ring and was intended to allow for typical, phased wellfield development to proceed within the licensed area. However, the actual aquifer exemption is limited to 100 feet beyond the perimeter monitor well ring of an actual mine unit as specifically stated by EPA in its exemption approval. Until Strata expands the monitor well ring to encompass additional mine units, the exempted aquifer for Point of Exposure (POE) purposes only includes that portion of the aquifer 100 feet beyond the MU1 monitor well ring.

In 4.130 of LBP-15-3, the ASLB contemplated potential impacts to the DM downgradient from the production zones of the OZ due to the uncertainty of declining concentrations of uranium in an ACL scenario decades after restoration. In this scenario, the ACL analysis would have to include evaluation of the risk to the public at the POE, which would be 100 feet from the perimeter monitor well ring. It would not be practical in an ACL application to evaluate the risk to the public thousands of feet downgradient from a mine unit simply because that was where a line was drawn to accommodate future wellfield development. Therefore, Strata elected to use the 100-foot, science-based distance from the perimeter monitor well ring in the downgradient direction as the area of review for the expanded drill hole re-abandonment program. Table 3-1 and Table 2 of Attachment 4 describe the holes in this expanded area, and Figure 3-3 depicts the aquifer exemption boundary, 100-foot science-based buffer and the holes addressed by this revised LC.

Pursuant to the ASLB initial decision in LBP-15-3, Strata has attempted to locate and properly plug and abandon all historic exploration drill holes that penetrate the DM interval between the MU1 perimeter monitor well ring and the 100-foot science-based buffer used to establish the aquifer exemption boundary. As shown in Figure 1-2, Strata's future Ross wellfield development encompasses land areas downgradient of MU1, and the same well identification, plugging, and abandonment procedures will be applied in future wellfield data package development. Consistent with the ASLB's LBP-15-3 Order and its analysis therein, Strata will then identify, plug, and abandon all drill holes downgradient of future mine units that penetrate the DM interval and that can be located between future mine units and their associated science-based buffer areas. In the case of the most downgradient mine units this will be to the maximum approved aquifer exemption boundary as shown in Figure 1-2, while in upgradient mine units such as MU1 it will be 100 feet downgradient of the perimeter monitor well ring. These efforts are all conducted to ensure that the risk of future vertical migration of contaminants into the DM interval is reduced or eliminated.

These procedures are consistent with footnote 66 in LBP-15-3, where the ASLB states that "SEI's LC-required 'attempt' to locate and abandon all drill holes within the monitoring well ring embodies a level of effort that maximizes the potential for eliminating excursions…" This statement is consistent with the standard industry practice of identifying drill holes during wellfield testing that potentially could result in vertical or horizontal excursions. Further, by locating and re-abandoning an additional 14 of 16 drill holes within the 100-foot science-based buffer surrounding/downgradient of the MU1 perimeter monitor well ring, Strata has exceeded standard industry practice. As a result of the efforts that will be conducted by Strata over the course of the Ross ISR Project's lifecycle and the development of MU1 and future mine units, historic drill holes between the monitor well ring for MU1 and the maximum approved aquifer exemption boundary will be properly plugged and abandoned in

accordance with LC 10.12. Given that NRC Staff's evaluation of Strata's Ross ISR Project license application addressed the entire Ross ISR Project and not MU1, Strata's proposed procedures to properly identify, plug, and abandon historic boreholes between the monitor well ring and science-based buffer for each developed wellfield is consistent with the ASLB-directed revision of LC 10.12.

Table 3-1. Summary of Drill Hole Abandonment

Statistic	Number of Holes within MU1 Perimeter Ring/100 ft Science-Based Buffer[1]
Total Number of Holes Drilled[2]	460/16
Number of Exploratory Holes (Nubeth)	245/12
Number of Delineation Holes (Strata)	211/4
Number of Wells Abandoned (Strata)	4/0
Number of Nubeth Exploratory Holes Found	219/10
Number of Nubeth Exploratory Holes Not Found	21/2
Number of Nubeth Exploratory Holes within Archeological Site	5/0
Number of Holes Plugged with Cement or High Solids Bentonite[2]	434/14
Number of Holes Not Abandoned by Strata[2]	26/2

[1] Includes only those holes that penetrate the DM interval within the 100-foot science-based buffer area.

[2] Includes exploration and delineation drill holes.

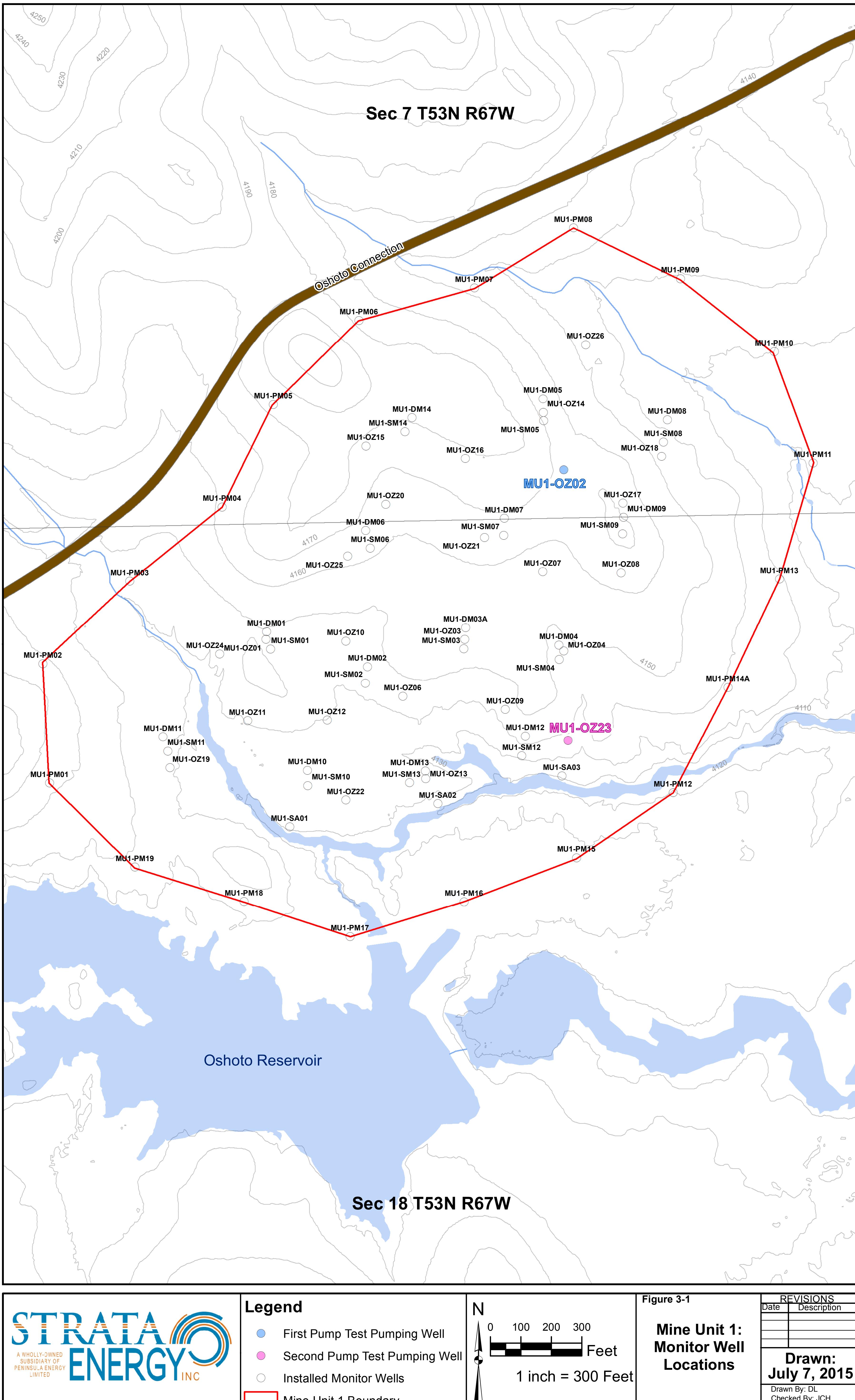


Figure 3-1

Mine Unit 1: Monitor Well Locations

REVISIONS	
Date	Description

Drawn: July 7, 2015

Drawn By: DL
Checked By: JCH

Source: O:\Mining\MU_1_Well_Field_Package\MU1_MonitorWellLocations.mxd

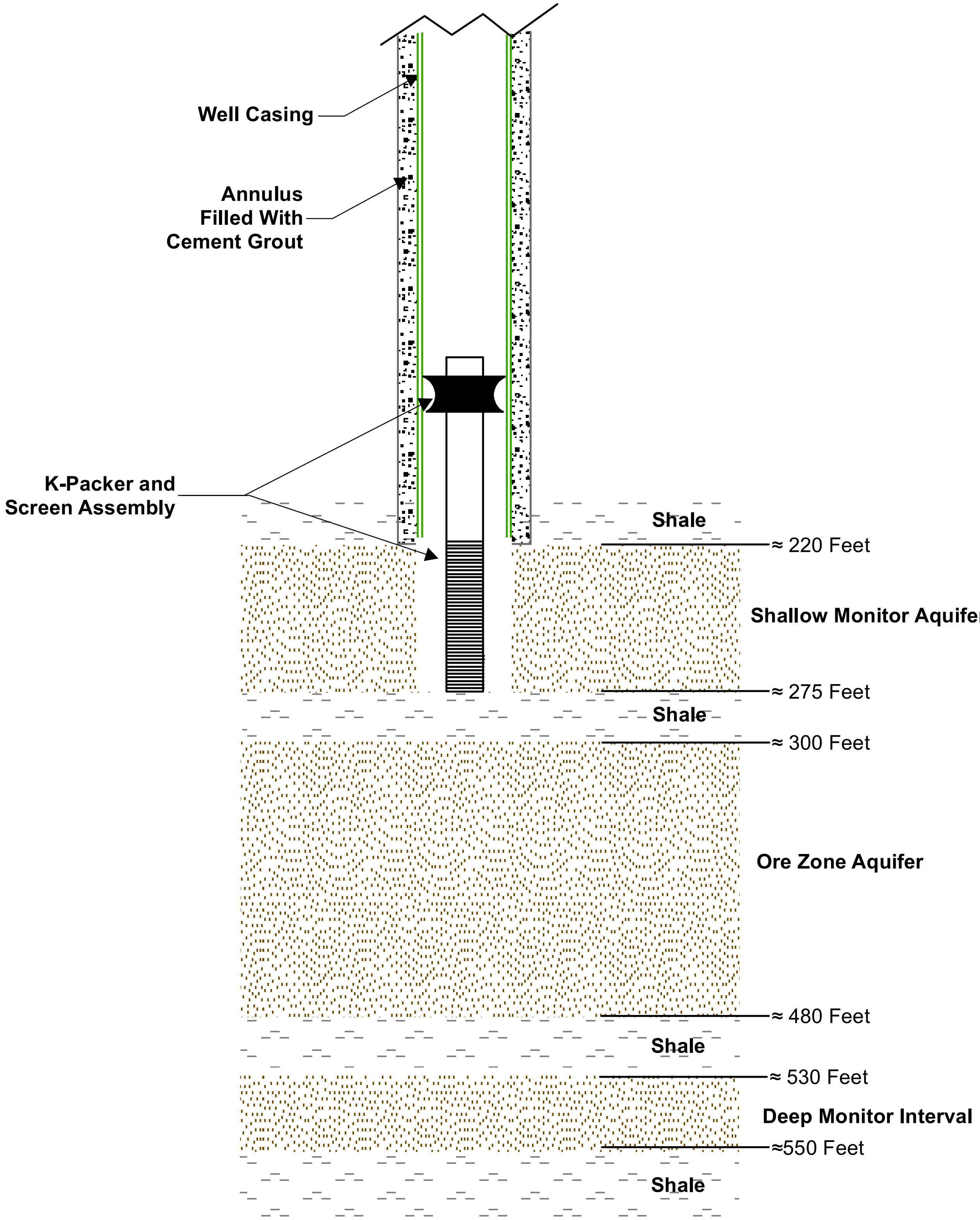


Diagram is not to scale.

Figure 3-2a Typical Well Completion for SM Well

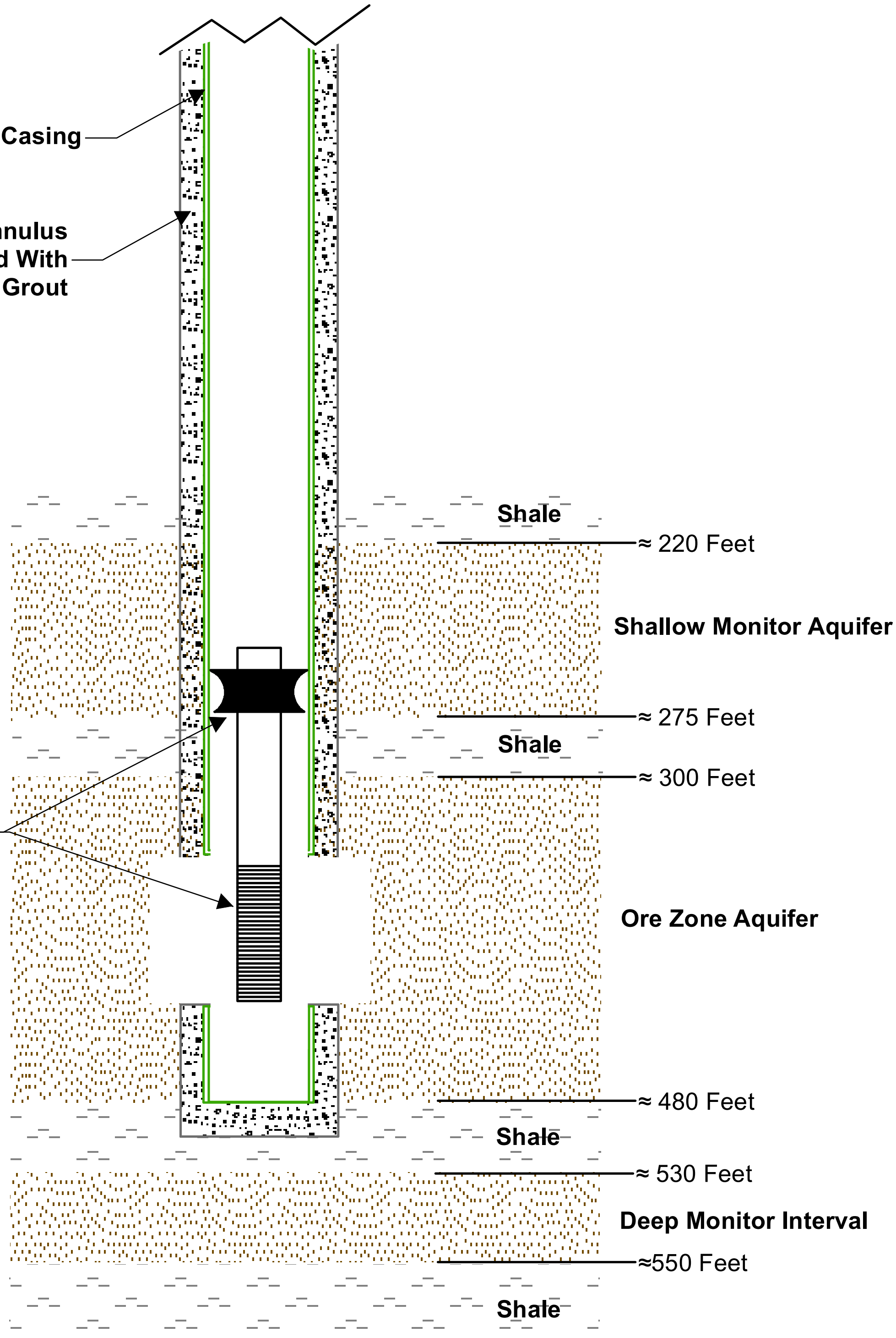


Diagram is not to scale.

Figure 3-2b Typical Well Completion for OZ Well

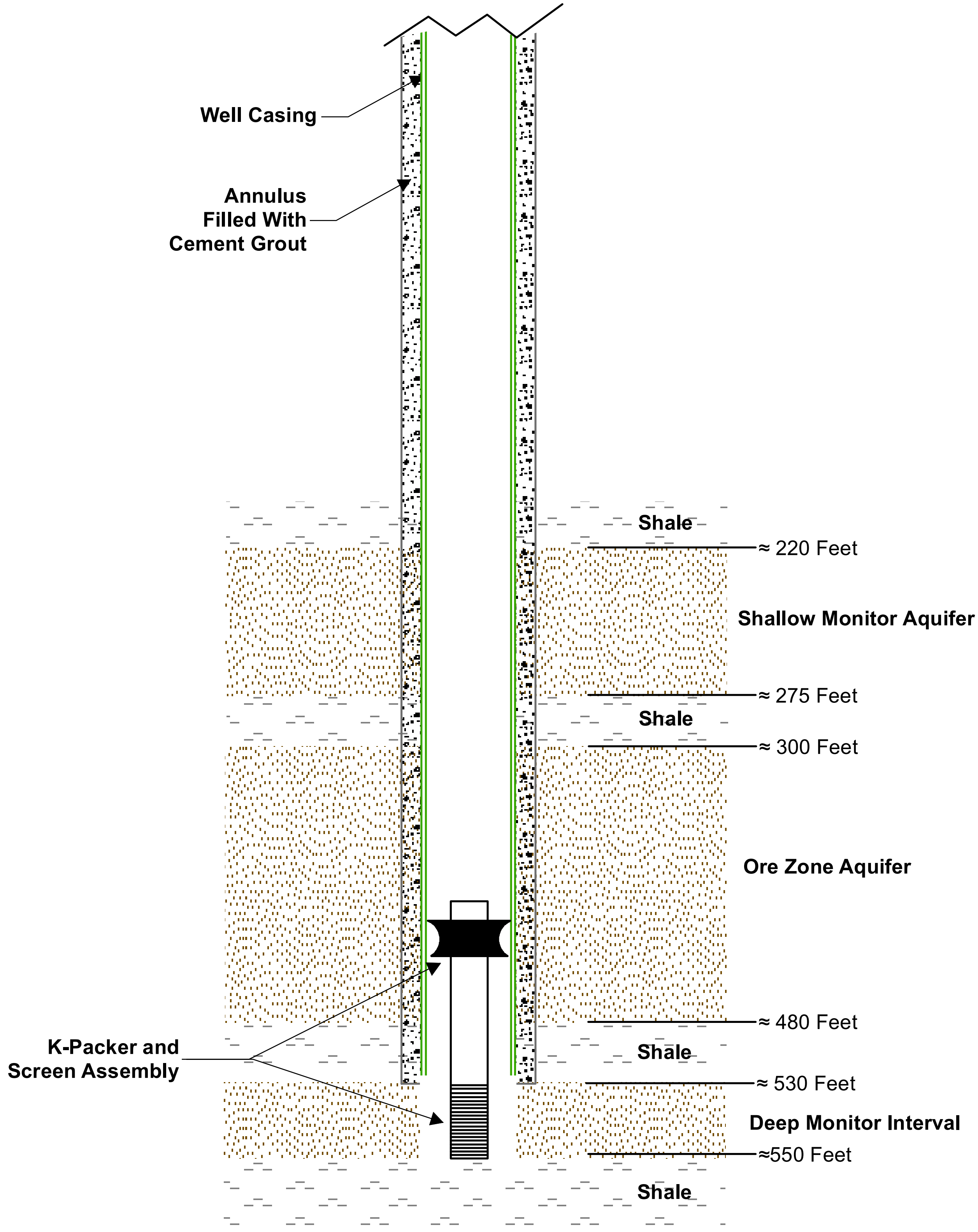


Diagram is not to scale.

Figure 3-2c Typical Well Completion for DM Well

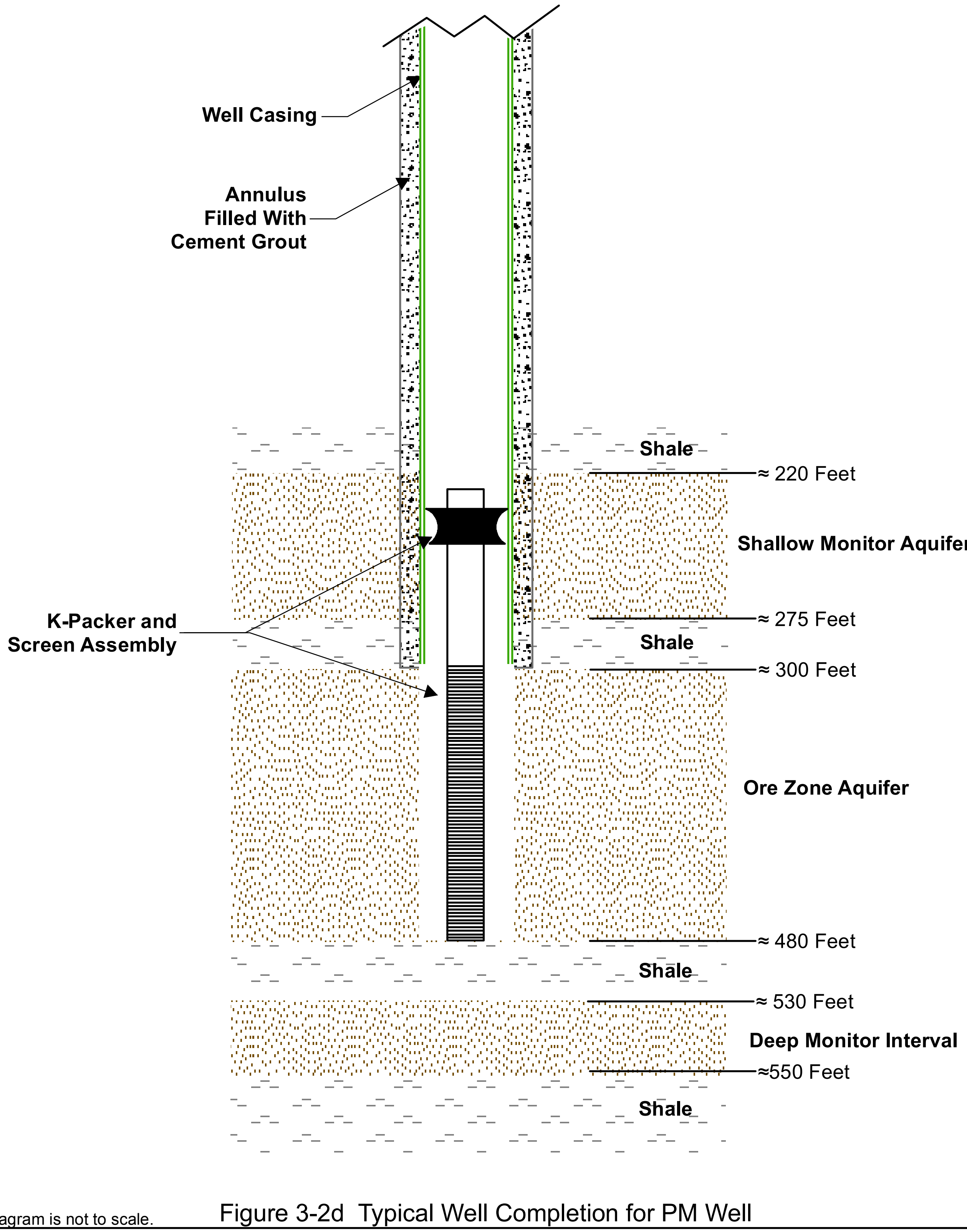


Figure 3-2d Typical Well Completion for PM Well

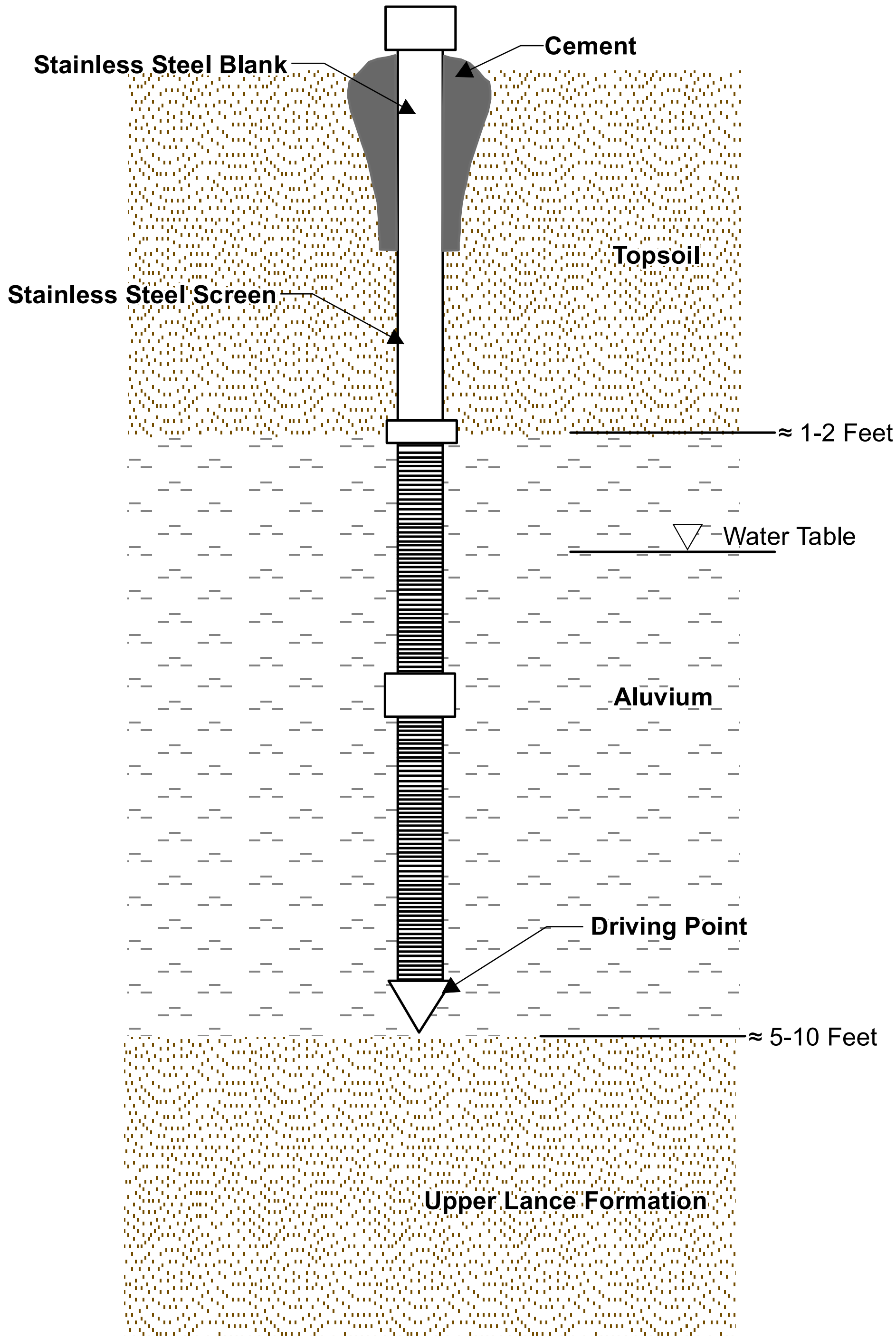
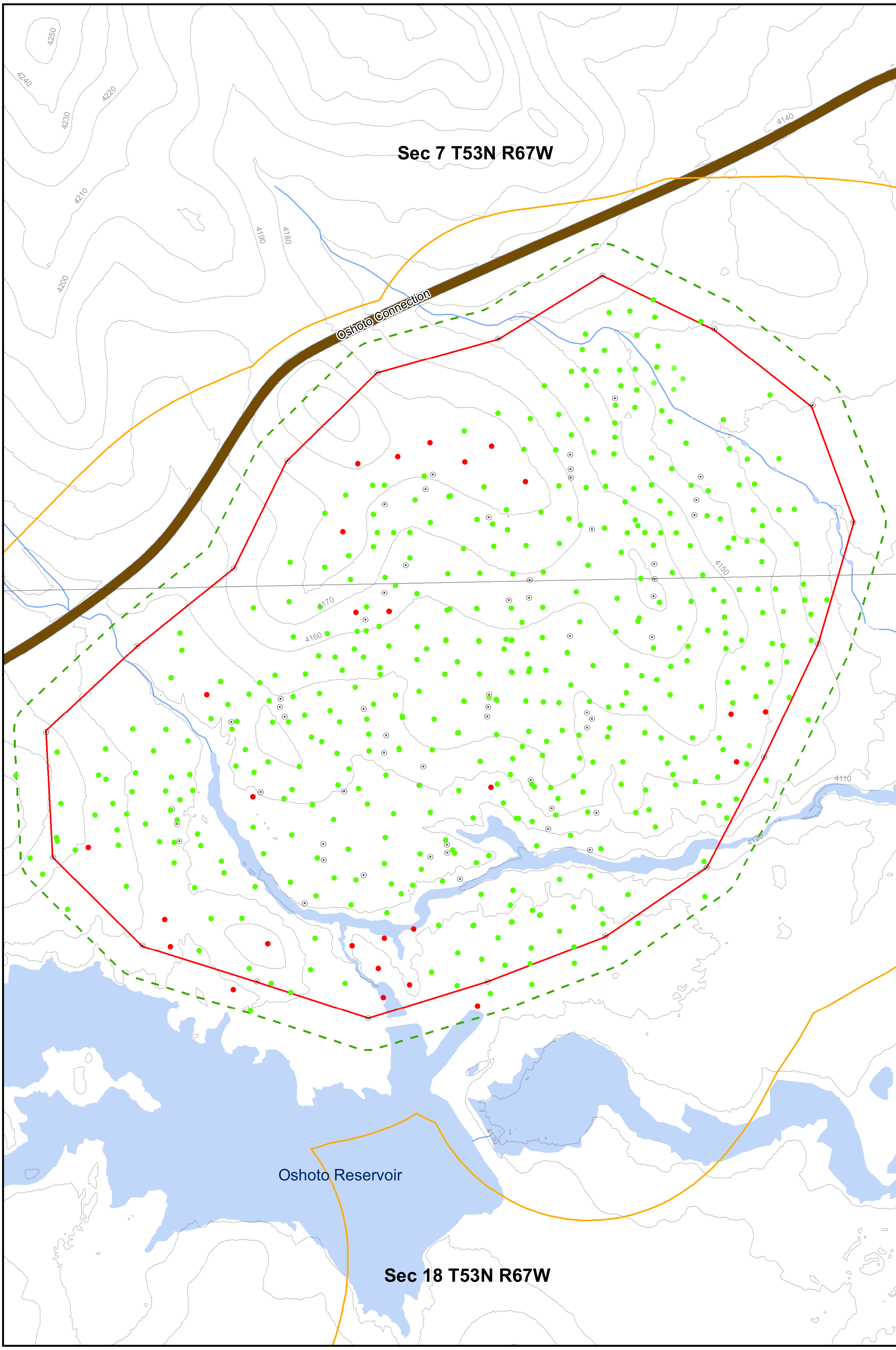


Diagram is not to scale.

Figure 3-2e Typical Well Completion for SA Well



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Legend

- Installed Monitor Wells
- Abandoned Holes & Wells
- Area of Unlocatable Drill Hole
- MU1 Boundary
- Science Based Exemption 100ft Buffer
- Approved Aquifer Exemption Boundary

N

0 100 200 300 Feet

1 inch = 300 Feet

Figure 3-3

Mine Unit 1: Existing Drill Holes and Wells

REVISIONS	
Date	Description

Drawn: July 7, 2015

Drawn By: DL
Checked By: JCH

Source: O:\Mining\MU_1_Well_Field_Package\MU1_DrillHolesandWells.mxd

4.0 AQUIFER TESTING

As described in Attachment 5, Strata conducted an aquifer test program within MU1. The objectives of the MU1 aquifer test program were: 1) to demonstrate that the perimeter wells and OZ wells (future production/injection wells) within the mine unit are in hydraulic communication, 2) to evaluate the level of hydraulic communication between the production zone and the overlying and underlying intervals, and 3) to evaluate the aquifer hydraulic characteristics of the OZ aquifer within the mine unit. As part of the aquifer testing program, three aquifer tests were conducted.

The first aquifer test was conducted using MU1-OZ02 as the pumping well. During this test, 73 wells were monitored. Of these, 26 were OZ baseline wells, 19 were PM wells, 14 were SM wells, and 14 were DM wells. During the first aquifer test no responses that could be attributed to the pumping test were observed in either the overlying SM wells or the underlying DM wells. Responses were observed in 13 of the PM wells and 25 of the OZ wells. No response was observed in six PM wells (MU1-PM12, MU1-PM13, MU1-PM14A, MU1-PM15, MU1-PM16, and MU1-PM17) and one OZ well (MU1-OZ23) in the southeastern portion of the wellfield.

A second aquifer test was conducted to further assess the hydraulic parameters in the southeastern portion of MU1. The second test area included pumping well MU1-OZ23, six PM wells (that did not respond to pumping in the first test), three interior OZ observation wells, three SM observation wells, and three DM observation wells. During the second aquifer test, drawdown was recorded in all of the PM wells, while a muted response was noted at the three interior OZ baseline wells (MU1-OZ04, MU1-OZ09, and MU1-OZ13). No responses were observed in any of the DM wells and two of the three SM wells. However, a slight response (0.4 ft) was noted in MU1-SM12.

Prior to the second aquifer test, Strata had been unable to plug and re-abandon several drill holes in the southeastern portion of MU1 due to wet

conditions and difficult topography. As soon as conditions improved sufficiently that the work could be completed safely with minimal disturbance, Strata re-abandoned all of the drill holes that could be located.

A third aquifer test was then conducted with MU1-OZ23 as the pumping well under relatively similar stress conditions (withdrawal rate and duration) as the second aquifer test. The third aquifer test demonstrated that re-abandoning the drill holes decreased the response in MU1-SM12 but did not eliminate it completely. This suggests that the response in MU1-SM12 can be attributed to an unlocatable drill hole. As discussed in Section 3.4, due to cultural sites, post Nubeth disturbance, and drill holes located in active drainages, not all of the drill holes were locatable or accessible.

Based on the results of the pumping tests, it was determined that there is a low permeability zone crossing the southeastern portion of MU1. As described in Section 2.1.1.1, this is attributed to a stratigraphic facies change due to a differing depositional environment. The low permeability zone was further delineated in the groundwater modeling and is shown in Figure 1-3.

The transmissivity and storage coefficient were estimated using the Aquifer^{Win32} software program using drawdown and recovery curves measured at each monitor well within the OZ aquifer. The drawdown curves were analyzed using methods presented by Cooper and Jacob (1946), and the recovery curves were analyzed using methods presented by Theis (1935). Table 4-1 summarizes the aquifer parameters measured within MU1. For comparison, Table 4-2 summarizes aquifer parameters measured in Strata's 2010 aquifer tests and in 1977-78 Nubeth aquifer tests. The results of the MU1 aquifer tests are comparable to previous aquifer tests conducted within the Ross permit area.

The hydraulic characteristics of the DM wells were also analyzed as part of the aquifer test program. Strata's well sampling techniques for the DM wells allowed for the aquifer characteristics to be estimated using traditional slug

analyses techniques. As part of the analysis, transmissivities were calculated for 14 DM wells. Transmissivities calculated in the DM interval range from 0.01 to 0.06 ft^2/day with an average of 0.03 ft^2/day. The transmissivities in the DM interval are several orders of magnitude lower than the transmissivities calculated in the OZ aquifer.

In summary, the MU1 aquifer test program was successful in meeting its original objectives.

1) The aquifer tests demonstrated that all the PM wells are in communication with OZ aquifer.
2) With the exception of the minor response observed at MU1-SM12 no responses due to pumping were observed in any of the wells completed in the overlying SM or underlying DM intervals.
3) Through multiple observation wells completed in the OZ aquifer the hydraulic parameters of the OZ aquifer were calculated throughout the MU1 wellfield and found to be consistent with previous analysis.

The consistency of the hydraulic characteristics of the OZ aquifer confirm the adequacy of perimeter well spacing and offset distances established in the approved permit/license documents along with demonstrating the relatively homogenous nature of the uranium host aquifer within MU1.

Table 4-1. Summary of Calculated Hydraulic Parameters in the OZ Aquifer

	Transmissivity (sq ft/day)	**Contributing Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (unitless)**
Calculated Hydraulic Parameters at OZ Observation Wells within All but the Southeastern Portion of MU1				
Min.	59.1	109	0.48	8.0E-05
Max.	75.7	130	0.63	6.0E-04
Avg.	65.9	121	0.54	1.6E-04
Number of Observation Wells	25			
Calculated Hydraulic Parameters at PM Wells within All but the Southeastern Portion of MU1				
Min.	75.4	131	0.48	7.5E-05
Max.	156.1	181	0.93	2.0E-04
Avg.	102.7	153	0.67	1.3E-04
Number of Observation Wells	12			
Calculated Hydraulic Parameters at OZ Observation Well within the Southeastern Portion of MU1				
MU1-OZ23*	25.2	122	0.21	N/A
Hydraulic Characteristics Calculated at PM Wells within the Southeastern Portion of MU1				
Min.	41.1	153	0.24	4.95E-05
Max.	80.9	192	0.42	2.7E-04
Avg.	58.9	174	0.34	1.5E-04
Number of Observation Wells	6			

* The only interior OZ well in the second aquifer test that responded enough to be analyzed was the pumping well (MU1-OZ23).

Table 4-2. Summary of the OZ Aquifer Hydraulic Characteristics from 2010 and Nubeth Aquifer Tests

	Transmissivity (sq ft/day)	**Contributing Aquifer Thickness (ft)**	**Hydraulic Conductivity (ft/day)**	**Storage Coefficient (unitless)**
2010 Aquifer Tests (WWC, 2010)				
Min.	13.4	16	0.15	1.3E-5
Max.	172.5	105	6.17	1.6E-4
Avg.	74.9	48	2.72	7.3E-5
1977 Aquifer Tests for Nubeth (Hamilton, 1977)				
Min.	16.83	114	0.14	8.5E-5
Max.	21.24	121	0.19	2.4E-4
Avg.	18.94	118	0.16	1.4E-4
1978 Aquifer Tests for Nubeth (Manera, 1978)				
Min.	12.83	85	0.15	4.5E-5
Max.	29.41	85	0.35	8.3E-5
Avg.	18.58	85	0.22	5.8E-5

5.0 GROUNDWATER MODELING

As described in Attachment 6, a site-specific groundwater model was developed for the MU1 wellfield area using MODFLOW with Groundwater Vistas as the pre/post processing software. The site-specific groundwater model was developed as an extension of Strata's previous Ross Project groundwater model (Ross Groundwater Model). The MU1 Groundwater Model was developed to satisfy the following goals:

- Refinement of the Ross Groundwater Model to simulate operational conditions specific to MU1.
- Verification that the previous analyses in the Ross Groundwater Model are still valid given the collection of additional site-specific data in MU1.
- Verification that an inward hydraulic gradient can be maintained under balanced wellfield conditions in MU1.
- Verification that bleed rates between 0.5 and 2.0 percent (as estimated in the approved permit/license applications) will function properly during operations in MU1.

To develop the MU1 Groundwater Model, the Ross Groundwater Model was refined using a telescopic mesh refinement routine in Groundwater Vistas. After using the mesh refinement routine, the MU1 model had a smaller model domain, decreased grid spacing, and updated general head boundary conditions which mimic interactions with the larger model area without the need to include all the layers or complicated geology included in the Ross Groundwater Model. The final MU1 Groundwater Model includes three layers, all of which represent the OZ aquifer. Since aquifer testing has demonstrated that the shales overlying and underlying the OZ aquifer are confining, no additional layers were included in the MU1 Groundwater Model.

The MU1 Groundwater Model was further refined through calibration to reflect the hydraulic characteristics measured over the course of the MU1 aquifer tests (Attachment 5). The groundwater modeling exercise included three separate phases: (1) calibration to steady-state preoperational

conditions; (2) verification to transient conditions during the first May 2015 aquifer test; and (3) uranium recovery simulations. During the steady-state calibration, model parameters were adjusted to represent conditions prior to the aquifer tests performed in 2015. During the transient verification phase, model parameters were adjusted to match model-predicted results with measured drawdowns that occurred during the first aquifer test performed by Strata in May 2015. After the model was calibrated, ISR wellfield simulations were conducted at locations both northwest and southeast of the low permeability area identified during the aquifer tests and apparent on the geologic cross sections.

The second goal of the modeling exercise was to verify that the previous analyses in the Ross Groundwater Model are still valid given the collection of additional site-specific data in MU1. Given the fact that the calibrated MU1 Groundwater Model largely has similar properties for the OZ aquifer (thickness, hydraulic conductivity, and specific storage) as the Ross Groundwater Model, the analyses performed in the Ross Groundwater Model are considered valid for MU1. The only area within MU1 that is unique compared to the Ross Groundwater Model is the low permeability area identified during the aquifer testing. However, additional site-specific operational modeling conducted in this area demonstrates that operations near the low permeability area will not behave significantly different from operations in the remainder of MU1.

The third and fourth goals of the MU1 Groundwater Model were accomplished through the series of operational simulations conducted for MU1. All simulations demonstrate that an inward hydraulic gradient will be maintained at bleed rates between 0.5 and 2.0 percent. Modeling performed for MU1 indicates that for larger wellfield pattern areas bleed rates as low as 0.5 percent may be adequate. The modeling demonstrates that the presence of a low permeability area within the southeastern portion of MU1 will not prevent ISR operations from safely occurring on either side of the low permeability area. Furthermore, the existence of the low permeability area may actually decrease

the bleed requirements needed to maintain an inward hydraulic gradient within the wellfield. Wellfield patterns will be adjusted to accommodate the low permeability area.

The ISR simulations at MU1 demonstrate that ISR operations can be safely conducted on both sides of the low permeability area. Strata's proposed 7-spot patterns (hexagons) are expected to provide added wellfield control over the previously simulated 5-spot patterns used in the Ross Groundwater Model, since injection will be spread out over more wells. Attachment 6 provides a more detailed simulation conducted in the southeastern wellfield area to assess the risk of a vertical excursion into the SM aquifer.

As noted previously, the second and third MU1 aquifer tests showed a small response to pumping in one SM well, attributed to an unlocatable borehole(s). A detailed modeling analysis conducted in the southeastern wellfield area near MU1-OZ23 demonstrates that the risk of an excursion into the SM aquifer is low because there is a significant downward gradient between the SM and OZ aquifers and the individual well injection rates are not high enough to induce injection pressures that would exceed the natural gradient between the aquifers. Near MU1-OZ23 the potentiometric surface of the SM aquifer is approximately 32 feet higher than that in the OZ aquifer. During the modeling simulation the peak injection pressure observed 2 feet from the injection well with the highest modeled injection rate was still 12 feet below the potentiometric surface of the SM aquifer.

6.0 BACKGROUND GROUNDWATER QUALITY

Sampling was completed to determine the pre-operational background water quality of the ore zone (OZ) aquifer, perimeter monitor (PM) wells, and the shallow monitor (SM) and deep monitor (DM) intervals in MU1 prior to operations in accordance with NRC license SUA-1601 and WDEQ/LQD Permit to Mine No. 802 requirements. Water quality data acquisition during wellfield pre-operational background characterization included collecting at least four samples, with a minimum of 14 days between sampling events, for all OZ, PM, SM, and DM monitor wells. In addition, quarterly samples were collected from three surficial aquifer (SA) wells. Table 6-1 provides the sampling events for each monitor well.

All sample events included analyses for the parameters listed in Ross Technical Report Table 5.7-2 with the exception of Round 4. The parameter list for Round 4 was changed for consistency with guidance in NUREG-1569. The parameter list change was approved by WDEQ/LQD as a non-significant revision (NSR) and verbally approved by NRC staff. On May 27, 2015, Strata submitted a license amendment application to NRC staff formally requesting approval of changes to Table 5.7-2 (NRC ADAMS accession no. ML15149A023).

As described in this section, pre-operational sampling serves two purposes. First, it is used to calculate proposed target restoration values (TRVs), which are the groundwater protection standards applicable during groundwater restoration. Second, it is used to calculate upper control limits (UCLs) for the approved excursion monitoring parameters.

6.1 Sampling Procedures

Prior to sample collection, each well was purged in order to obtain a representative sample of the formation. Purging was accomplished at a flow rate that was lower than the well development rate. For all OZ, PM, and SM wells a minimum of three casing volumes were removed prior to sample collection. The SA wells were generally bailed dry and then sampled following

recovery, since they do not produce a sufficient quantity of water to remove three casing volumes and then collect samples in a timely manner. In conjunction with well purging, field parameters (pH, conductivity, temperature, dissolved oxygen, oxidation/reduction potential, and turbidity) were measured and recorded on the respective field sheet. Water quality samples were collected after purging at least three casing volumes and after at least three field parameter readings indicated that the water quality was stable.

Due to the low yield of the DM wells within MU1, swabbing was the preferred sampling method. A water level measurement was taken prior to swabbing each well. Wells were swabbed to within 10 feet of the K-Packer depth but no closer due to the possibility of pulling the screen assembly upward. The DM wells were then given a day to recharge enough water to obtain a sample with the swabbing unit. Samples were collected from a 5-gallon bucket filled from the swab.

Sample containers were filled completely to exclude air. The time of sample collection was recorded on the field sheet as well as any remarks as to unusual water quality conditions observed by the sampler (e.g., odor or color). The samples were placed in an iced cooler (≤ 6°C) and transported to the contract laboratory.

Samples requiring filtering were field filtered using disposable 0.45-micron pore size filters. Preservative (acid) was added to sample containers immediately after collection and filtration, as required. All samples submitted to the laboratory were accompanied with a chain of custody (COC) form. The COC described the type of sample, sample identification number, preservation techniques (if any), name of the sampler, date and time the sample was taken, and the required analysis.

6.1.1 QA/QC Procedures

The following describes the QA/QC procedures that were followed during the MU1 pre-operational sampling program.

- Field pH and conductivity meters were calibrated before each day's use.
- Each well was purged before sampling to ensure that any stagnant water was removed and representative groundwater was drawn into the well bore. Field parameters (pH, conductivity, temperature, dissolved oxygen, oxidation/reduction potential, and turbidity) were measured a minimum of three times during purging with variation less than 10% prior to sample collection, with the exception of the DM wells. Field parameters were measured in DM wells once prior to sample collection.
- A minimum of 10% field duplicate and 5% field blank samples were collected. Relative percent difference (RPD) statistical analysis was completed for all duplicate samples.
- The pH and conductivity probes were stored in sample water between wells instead of deionized water that might negatively impact the probe performance. At the end of each day the probes were rinsed with deionized water to remove any salts.
- All samples analyzed by the contract laboratory were accompanied with a COC to ensure proper analysis was performed and the sample was tracked.

6.1.2 Water Level Measurements

Well water levels were monitored using an electrical measuring line (e-line) accurate to 1/100th of a foot. The e-line measures electrical conductance using two electrodes contained in a shielded probe. The probe was mounted to a graduated strip to allow measurement of water levels. The probe was slowly lowered into each well. When the probe contacted the water surface in the well, an audible device was actuated.

6.2 Pre-Operational Groundwater Quality Sampling Results

This section provides a detailed analysis of pre-operational groundwater quality including identifying potential outliers, comparing results to state and federal water quality criteria, and calculating proposed TRVs and UCLs. Water quality results are summarized in Attachment 7, laboratory analytical reports are provided in Attachment 8, the outlier evaluation is provided in Attachment 9, a quality assurance report of the aqueous results is provided in

Attachment 10, groundwater quality comparison to WDEQ/WQD and EPA standards are provided in Attachment 11, TRV calculations are provided in Attachment 12, and UCL calculations are provided in Attachment 13.

6.2.1 QA/QC Results

All field sheets and laboratory reports were reviewed for completeness and adherence to sampling procedures. Laboratory reports were compared to field sheets to verify that field parameters and sample collection times were incorporated into the laboratory reports appropriately. The initial review also included comparing field and laboratory values, analyzing cation-anion balances, and comparing the measured TDS concentrations with the calculated TDS values from the laboratory. Following this initial screening process, the electronic data file, accompanying each laboratory report, was uploaded directly to the water quality database to avoid data transcription errors. Attachment 10 includes a detailed QA/QC evaluation. The report describes the precision, accuracy, completeness, and comparability of the pre-operational groundwater sampling results. As presented in the report, all of the metrics used by Strata indicate that the data are valid.

6.2.2 Evaluation of Potential Outliers

A multi-step process was used to screen for potential outliers, which are anomalously high or low values relative to the other values. The process was chosen for consistency with methods recommended by WDEQ/LQD Guideline 4, ASTM D6312-98 (ASTM 2012), and EPA Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA Unified Guidance, EPA 2009). The following three-step process was used to screen for potential outliers and to determine whether to remove statistical outliers from the background water quality data sets prior to calculating statistics (i.e., minimum, maximum, and average concentrations), TRVs, and UCLs.

Step one involved grouping background water quality sampling results by sampling interval (i.e., OZ, PM, SM, and DM) and then using visual screening methods to identify suspected outliers. Visual screening was conducted using normal and, in some cases, lognormal probability plots to determine the approximate data distribution and to identify suspected outliers for statistical testing.

In the case of constituents with detection frequencies less than 25 percent, no attempt was made to identify the data distribution or screen for potential outliers. This is consistent with ASTM D6312-98, which recommends using non-parametric groundwater protection standards where the detection frequency is less than 25 percent. The outlier evaluation in Attachment 9 indicates which parameters had detection frequencies less than 25 percent for each monitoring interval. In addition, outlier evaluation was not conducted for field parameters, since these were not used to calculate TRVs or UCLs. Outlier evaluation also was not conducted for the SA monitoring results, since additional data will be collected from the SA monitor wells prior to operations as described in Section 6.2.6.

Step two involved formal statistical testing of suspected outliers. Rosner's test, as recommended by EPA Unified Guidance, was used to test for one or more suspected outliers in moderate to large-sized data sets (i.e., with 25 or more values). Dixon's test was used to test the least extreme, single suspected outlier value for data sets with less than 25 values. EPA ProUCL Version 5.0 (EPA 2013) was used to calculate the Rosner's and Dixon's test statistics based on the approximate data distributions (normal or lognormal) and suspected outliers identified during visual screening.

In addition, the tolerance interval method, as recommended by WDEQ/LQD Guideline 4, was used to evaluate potential statistical outliers. This method assumes that the data are normally distributed (without outliers) and calculates a tolerance interval based on the mean concentration, standard deviation, and a tolerance limit factor that is specified in Guideline 4 for a given

sample size, confidence level (95%), and coverage (99%). Since the Guideline 4 method assumes that the data without outliers are normally distributed, tolerance intervals were calculated using the natural logarithms of the concentration values for constituents for which the lognormal distribution assumption was determined to be reasonable. Suspected outlier values were compared to tolerance intervals that were calculated to exclude the suspected outlier values. If the suspected outliers were above or below the tolerance interval, they were identified as statistical outliers according to the WDEQ/LQD Guideline 4 method.

Step three involved evaluating statistical outliers to determine whether they should be removed from the pre-operational data set prior to calculating statistics, TRVs, and UCLs. EPA Unified Guidance recommends that "testing of outliers be performed on background data, but they generally not be removed unless some basis for a likely error or discrepancy can be identified." Therefore, statistical outliers were evaluated to determine whether a basis for a likely error or discrepancy could be identified. This included verifying that no data recording errors occurred; comparing the statistical outlier sample result with all other measurements of that parameter in that well to determine whether the value was consistent with other sample results from that well; and evaluating other parameters from that well and that sampling event to determine whether other, similar parameters were consistent with the statistical outlier, particularly those that were measured using the same analytical methods. Following this process, statistical outliers were either removed from the data (generally if they were not in agreement with other sample results from that well) or kept (generally if they were consistent with other sample results from that well, in which case they were determined to represent natural variability in the background concentration for that parameter in that monitoring interval). In some cases, suspected outliers identified during visual screening were removed as outliers if it was determined that they were anomalously high or low values compared to the other results from that well, even if they failed one

or more of the statistical tests. This was done to avoid calculating groundwater protection standards (TRVs or UCLs) based on data determined to be unrepresentative of the pre-operational background groundwater quality.

Attachment 9 provides the results of the outlier evaluation, including a summary table of all suspected outliers and outlier evaluation results for each monitoring interval. In general, relatively few outliers were identified, and a normal or lognormal distribution assumption was found to be reasonable for all constituents with a sufficient detection frequency to perform outlier evaluation. These findings support the conclusion that the OZ aquifer and other monitoring intervals are relatively homogenous within MU1 based on similar groundwater quality within each interval.

6.2.3 Ore Zone (OZ) Sampling Results

General water chemistry in the OZ aquifer within MU1 is dominated by sodium cations and sulfate and bicarbonate anions. This is consistent with the regional baseline monitoring results for the Ross ISR Project, as presented in Strata's approved permit/license applications. The TDS ranged from 1,340 to 2,520 mg/L, and the pH ranged from 8.6 to 9.3 s.u.

The OZ wells measured the highest concentrations of dissolved uranium and radiological constituents of the five monitoring intervals. All OZ wells measured concentrations of dissolved uranium above the detection limit of 0.0003 mg/L. As expected, the OZ wells also measured increased concentrations of radiological constituents including dissolved radium-226, gross alpha, and radon-222.

A comparison of groundwater quality in the OZ wells to WDEQ/WQD class of use standards indicates that the water is likely suitable for industrial use (Class IV) only. A summary of the constituents exceeding the class of use standards is presented in Table 6-2, and Attachment 11 provides the comparisons on a well-by-well basis. Multiple OZ wells exceeded the WDEQ/WQD Class I, II, and III standards for pH (8.5 s.u. for Class I and III

and 9.0 s.u. for Class II), gross alpha (15 pCi/L), and combined radium-226 and 228 (5 pCi/L).

The groundwater in the OZ wells was also compared to EPA drinking water standards, as summarized in Table 6-3 (see also detailed comparisons in Attachment 11). Most OZ wells exceeded the EPA MCLs for uranium (0.03 mg/L), gross alpha (15 pCi/L), and combined radium-226 and 228 (5 pCi/L). In addition, all of the OZ wells exceeded EPA secondary standards for pH (8.5), TDS (500 mg/L), and sulfate (250 mg/L) in at least one sample. One OZ well also exceeded the secondary standard for aluminum (0.05 mg/L). Based on these results, Strata concludes that the OZ aquifer within MU1 is likely suitable for industrial use only.

6.2.4 Perimeter Monitor (PM) Well Sampling Results

The water quality of the PM wells was similar to the OZ wells except that radionuclide concentrations were generally lower. The TDS concentrations ranged from 1,170 to 1,960 mg/L, and the pH ranged from 8.5 to 9.1 s.u.

Dissolved uranium concentrations in the PM wells ranged from non-detect (less than 0.0003 mg/L) to 0.066 mg/L. Similarly, gross alpha and dissolved radium-226 concentrations ranged from non-detect to above the WDEQ and EPA groundwater quality standards as described below.

Table 6-2 provides a summary of the constituents in the PM wells that exceeded WDEQ/WQD class of use standards. Attachment 11 provides the comparisons on a well-by-well basis. Similar to the OZ wells, most of the PM wells exceeded the WDEQ Class I, II, and III standards for pH and gross alpha. Two PM wells exceeded the combined radium-226 and 228 standard (Class I, II, and III).

Table 6-3 summarizes the groundwater quality in the PM wells compared to EPA drinking water standards. The tables shows that one or more samples exceeded the EPA MCL for gross alpha, combined radium-226 and 228, uranium, and arsenic (0.01 mg/L). In addition, all of the PM wells

exceeded EPA secondary standards for pH, TDS and sulfate, and one well exceeded the secondary aluminum standard. These results support the conclusion that the OZ aquifer contains water that is only suitable for industrial purposes.

6.2.5 Shallow Monitor (SM) Well Sampling Results

The water chemistry of the SM wells was the most consistent throughout MU1 of any of the monitoring intervals. The water chemistry in SM wells was dominated by sodium cations and bicarbonate/carbonate anions. TDS concentrations ranged from 850 to 1,540 mg/L, and pH ranged from 8.6 to 9.5 s.u. Concentrations of radionuclides and dissolved metals including uranium were low or undetectable in all SM wells.

Based on a comparison with WDEQ standards (Table 6-2 and Attachment 11), the groundwater in the SM wells is likely Class III (suitable for livestock). The pH, TDS, and sulfate concentrations exceeded Class I standards in nearly every SM well. Sulfate was above the Class II (agricultural) standard in nearly every SM well. One SM well exceeded the Class I, II, and III gross alpha standard in one sample.

Groundwater quality in the SM zone is compared to EPA drinking water standards in Table 6-3 and Attachment 11. One sample from one well exceeded the primary MCL for gross alpha. In addition, nearly all SM wells exceeded the EPA secondary standards for pH, TDS, and sulfate, and one or more wells exceeded the fluoride and aluminum secondary standards.

6.2.6 Surficial Aquifer (SA) Well Sampling Results

As described in Section 3.1.4, three SA wells were installed in the saturated unconsolidated alluvium. The wells were monitored on a quarterly basis beginning 1st quarter 2015. Water quality results available to date for the SA wells are provided in Attachments 7 and 8. Based on the results available to date, two of the SA wells (MU1-SA2 and MU1-SA3) have sodium-bicarbonate

type water, while the third well (MU1-SA1) is dominated by sodium and sulfate. The TDS concentrations range from 820 to 5,390 mg/L, with the TDS concentration in well MU1-SA1 approximately five times greater than in the other two wells. pH ranged from 8.6 to 9.2 s.u.

Well MU1-SA1 measured relatively high levels of uranium and radionuclides (especially gross alpha). The other two wells also measured detectable concentrations of radionuclides, but at lower concentrations than MU1-SA1.

Based on a comparison with WDEQ standards, the groundwater in the SA wells is likely Class II, III, or IV as summarized in Table 6-2. TDS, sulfate, and gross alpha concentrations in well MU1-SA1 exceeded the Class I, II, and III standards. The other two wells exceeded the Class I pH and TDS standards, and well MU1-SA3 also exceeded the Class II and III sulfate standards.

Table 6-3 summarizes the comparison of the SA zone groundwater quality to EPA drinking water standards. Well MU1-SA1 exceeded the primary MCL for uranium and gross alpha. All sampled SA wells exceeded one or more secondary MCL for pH, TDS, sulfate, and/or aluminum.

Prior to operations, Strata will collect two additional quarterly samples from the three SA wells to meet the requirement of one year of pre-operational background water quality. UCLs will be calculated for the SA and provided to NRC and WDEQ/LQD in 1st quarter 2016. As added justification for the future pre-operational sampling in the SA wells, Strata plans to begin developing MU1 within module buildings farthest north, or in the portion of MU1 farthest from saturated unconsolidated alluvium. Based on the two quarterly sample results collected thus far, little temporal variability has been observed in the SA wells.

6.2.7 Deep Monitor (DM) Wells

The water quality of the DM wells is distinct from other zones due to relatively high concentrations of chloride. The chloride concentration in the DM wells ranged from 260 to 789 mg/L and averaged 559 mg/L, which was more

than 70 times the average concentration in the OZ wells. The TDS ranged from 1,400 to 2,690 mg/L, and pH ranged from 8.7 to 12.2 s.u. Chloride is the dominant anion with bicarbonate/carbonate and sulfate making up the balance of anions.

With the exception of radon-222, radionuclide concentrations in the DM wells were near or below detection limits. Radon-222 was measured above the detection limit in 11 of 14 DM wells.

A comparison of DM interval water quality to the WDEQ groundwater class of use standards indicates that the groundwater in all DM wells is likely suitable for livestock use (Class III; see Table 6-2). Class I and II standards were exceeded for a variety of constituents, including pH, ammonia, TDS, chloride, sulfate, and iron. Since pH is relatively easily treatable it was not used to assess the probable classification of groundwater.

Water quality results for the DM wells were also compared to EPA drinking water standards as summarized in Table 6-3. No constituents exceeded EPA primary MCLs, while samples from one or more DM wells exceeded secondary standards for pH, TDS, chloride, sulfate, aluminum, and iron.

6.3 Target Restoration Values (TRVs)

Strata committed in its approved license/permit applications to calculating target restoration values (TRVs), which are the groundwater protection standards that will apply within the production zone following groundwater restoration. More specifically, Strata committed to calculating TRVs for the OZ monitor wells as a function of the average baseline water quality and the variability in each parameter using statistical methods in accordance with ASTM D6312-98 (ASTM 2012). This section describes the statistical methods used to calculate TRVs and shows how these methods are consistent with ASTM D6312-98 and WDEQ/LQD Guideline 4.

When calculating groundwater protection standards such as TRVs, ASTM D6312-98 recommends first screening for potential outliers and identifying the approximate data distribution (normal, lognormal, or other). Both of these steps were accomplished during the evaluation of potential outliers (refer to Section 6.2.2 and Attachment 9). ASTM D6312-98 then recommends calculating prediction limits at 95% confidence levels if the data are normally or lognormally distributed, or calculating non-parametric prediction limits if neither the normal nor lognormal distribution assumptions are valid. The method of calculating TRVs for MU1 is consistent with this approach. However, instead of calculating prediction limits, which are specifically designed for detection monitoring (particularly at RCRA facilities) and include provisions for the number of future comparisons and the verification resampling method (neither of which is applicable to demonstrating compliance with groundwater protection standards following groundwater restoration), upper tolerance limits (UTLs) were calculated at a 95% confidence level. UTLs are focused specifically on the background concentration rather than future detection monitoring and are designed to contain a specified portion of the background concentration at a given confidence level. UTLs were also selected over prediction limits for consistency with WDEQ/LQD Guideline 4, which provides a method for calculating UTLs for normally distributed data.

UTLs were calculated for each constituent in Table 5.7-2 of Strata's approved license application (excluding field parameters), as revised in Strata's proposed license amendment application dated May 27, 2015 (NRC ADAMS accession no. ML15149A023). For constituents reasonably described by a normal distribution, UTLs were calculated using two methods. These included calculating 95% UTLs using EPA ProUCL Version 5.0 and calculating 95% UTLs using the WDEQ/LQD Guideline 4 tolerance interval method. In all of these cases, the UTL calculated using ProUCL was lower than that calculated using the Guideline 4 method. To be conservative, the UTLs used to establish proposed groundwater protection standards are those calculated using

ProUCL. For constituents reasonably described by a lognormal distribution, only EPA ProUCL Version 5.0 was used, since the Guideline 4 method assumes that the data are normally distributed. For two constituents reasonably described by a lognormal distribution (dissolved radium-226 and gross alpha), it was determined that the lognormal, 95% UTLs were not representative of the background population in that they were several times higher than the largest detectable concentration. Therefore, a non-parametric, 95% UTL was calculated for these two constituents using ProUCL. The resulting UTLs are equal to the largest detectable concentration in each case, which was determined to be more representative of the average water quality and variability in each parameter.

For constituents with a detection frequency between 85% and 100%, one-half of the detection limit was substituted for non-detect values in order to adjust the estimate of the sample mean and variance prior to calculating UTLs. This substitution method for low percentages of non-detects is consistent with EPA Unified Guidance. For constituents with a detection frequency less than 25% but greater than or equal to 1%, non-parametric UTLs were calculated as the largest detectable concentration for consistency with ASTM D6312-98. For constituents with a detection frequency of zero (that is, the constituent was not detected in any of the pre-operational background samples), the UTLs were calculated as the laboratory detection limit, which is also consistent with ASTM D6312-98.

UTL calculations are summarized in Table 6-4. Attachment 12 presents detailed calculations, including a summary table showing the approximate data distribution and calculation method for each constituent and the results of UTL calculations on a constituent-by-constituent basis. The proposed TRVs were then calculated as either the UTL or the 10 CFR Part 40, Appendix A, Table 5C maximum contaminant level for that constituent (if applicable), whichever is higher, in accordance with Strata's applicable permit/license requirements. More specifically, LC 10.6 of SUA-1601 requires Strata to restore

hazardous constituents in groundwater to the numerical groundwater protection standards in 10 CFR Part 40, Appendix A, Criterion 5B(5). The Criterion 5B(5) groundwater protection standards are Commission-approved background (CAB) or the Table 5C maximum contaminant level, whichever is greater, or an ACL. The UTLs shown in Table 6-4 are the proposed CAB values, and the TRVs are the proposed groundwater protection standards determined according to LC 10.6 requirements.

6.4 Upper Control Limits (UCLs)

In accordance with Strata's approved license/permit applications and LC 11.4 of SUA-1601, Strata calculated the upper control limits (UCLs) for the PM, SM, and DM intervals. UCLs for the SA interval will be provided to NRC and WDEQ/LQD in the 1st quarter 2016, following collection and analysis of the last two quarterly pre-operational background water quality samples.

The default excursion parameters for the PM, SM, and SA intervals are chloride, conductivity, and total alkalinity. Sulfate, conductivity, and total alkalinity are the default excursion parameters for the DM interval. Calculated UCLs are summarized in Table 6-5. Attachment 13 presents detailed calculations. The proposed UCLs were calculated as the average pre-operational background concentration plus 5 standard deviations, except for chloride, which was calculated as the average background concentration plus either 5 standard deviations or 15 mg/L, whichever was higher.

6.5 WDEQ/WQD Premining Groundwater Classification

The groundwater quality within each monitoring interval was compared to WDEQ class of use standards in Chapter 8 of the Wyoming Water Quality Rules and Regulations. Class I groundwater is suitable for domestic use, Class II groundwater is suitable for agricultural (i.e., irrigation) use, Class III groundwater is suitable for livestock, and Class IV groundwater is suitable for industrial use. Table 6-2 summarizes the probable classifications of groundwater within each zone (Strata acknowledges that only WDEQ can

formally classify groundwater within Wyoming). Well-by-well comparisons with WDEQ class of use standards are found in Attachment 11. Please refer to Sections 6.2.3 through 6.2.7 for discussions of constituents exceeding the class of use standards in each monitored interval.

Table 6-1. Monitor Well Sampling Events

	March	April								May							June				
Well ID	**31**	**20**	**21**	**22**	**23**	**24**	**27**	**28**	**29**	**13**	**14**	**15**	**20**	**27**	**28**	**29**	**1**	**10**	**11**	**12**	**15**
Ore Zone (OZ)																					
MU1-OZ1				X							X				X				X		
MU1-OZ2									X	X				X				X			
MU1-OZ3			X								X				X				X		
MU1-OZ4				X						X				X				X			
MU1-OZ6		X									X				X				X		
MU1-OZ7								X				X				X				X	
MU1-OZ8				X								X				X				X	
MU1-OZ9						X				X				X				X			
MU1-OZ10					X						X				X						X
MU1-OZ11									X	X				X				X			
MU1-OZ12									X		X					X			X		
MU1-OZ13									X		X						X				X
MU1-OZ14		X										X				X				X	
MU1-OZ15			X								X				X				X		
MU1-OZ16			X							X				X				X			
MU1-OZ17						X						X				X				X	
MU1-OZ18						X					X				X				X		
MU1-OZ19				X								X				X				X	
MU1-OZ20									X	X				X				X			
MU1-OZ21									X		X				X				X		
MU1-OZ22						X											X				X
MU1-OZ23									X		X				X				X		
MU1-OZ24					X						X				X				X		
MU1-OZ25					X						X				X				X		
MU1-OZ26		X								X				X				X			
Perimeter Monitor (PM)																					
MU1-PM1								X		X				X				X			
MU1-PM2							X				X				X				X		
MU1-PM3							X				X				X				X		
MU1-PM4								X			X				X				X		
MU1-PM5								X			X				X				X		
MU1-PM6						X					X				X				X		
MU1-PM7					X						X				X				X		
MU1-PM8							X			X				X				X			
MU1-PM9						X				X				X				X			
MU1-PM10							X			X				X				X			
MU1-PM11								X				X				X				X	
MU1-PM12								X		X				X				X			
MU1-PM13									X	X				X				X			

Table 6-1. Monitor Well Sampling Events (Cont.)

	March	April								May							June				
Well ID	**31**	**20**	**21**	**22**	**23**	**24**	**27**	**28**	**29**	**13**	**14**	**15**	**20**	**27**	**28**	**29**	**1**	**10**	**11**	**12**	**15**
MU1-PM14A								X			X				X				X		
MU1-PM15								X		X				X				X			
MU1-PM16								X				X				X				X	
MU1-PM17								X		X				X				X			
MU1-PM18								X		X				X				X			
MU1-PM19								X				X				X					X
Shallow Monitor (SM)																					
MU1-SM1				X								X				X				X	
MU1-SM2					X							X				X				X	
MU1-SM3									X		X				X				X		
MU1-SM4									X	X				X				X			
MU1-SM5		X									X				X				X		
MU1-SM6			X									X				X				X	
MU1-SM7				X								X				X				X	
MU1-SM8		X										X				X					X
MU1-SM9		X										X				X				X	
MU1-SM10					X						X				X				X		
MU1-SM11									X			X				X				X	
MU1-SM12									X		X				X				X		
MU1-SM13									X	X				X				X			
MU1-SM14			X								X				X				X		
Deep Monitor (DM)																					
MU1-DM1									X		X				X				X		
MU1-DM2									X		X				X				X		
MU1-DM3A								X				X				X				X	
MU1-DM4									X		X				X				X		
MU1-DM5									X		X				X				X		
MU1-DM6								X				X				X				X	
MU1-DM7								X				X				X				X	
MU1-DM8								X				X				X				X	
MU1-DM9								X				X				X				X	
MU1-DM10								X				X				X				X	
MU1-DM11								X				X				X				X	
MU1-DM12								X			X				X				X		
MU1-DM13								X			X				X				X		
MU1-DM14								X				X				X				X	
Surficial Aquifer (SA)																					
MU1-SA1	X												X								
MU1-SA2									X				X								
MU1-SA3	X												X								

Table 6-2. Comparison with WDEQ Class of Use Standards

	Probable WDEQ Class of Use	Parameters Exceeding Class I Standards	Parameters Exceeding Class II Standards	Parameters Exceeding Class III Standards
OZ	IV	Ammonia, pH, TDS, sulfate, gross alpha, radium-226 and radium-228	pH, TDS, sulfate, gross alpha, radium-226 and radium-228	pH, gross alpha, radium-226 and radium-228
PM	IV	Ammonia, pH, TDS, sulfate, gross alpha	pH, TDS, sulfate, gross alpha, radium-226 and radium-228	pH, gross alpha, radium-226 and radium-228
SM	III	pH, TDS, sulfate, gross alpha	pH, sulfate, gross alpha	pH, gross alpha
SA	II - IV	pH, TDS, sulfate, gross alpha	pH, TDS, sulfate, gross alpha	pH, TDS, sulfate, gross alpha
DM	III	Ammonia, pH, TDS, chloride, sulfate, boron, iron	pH, TDS, chloride, sulfate, boron	pH

Note: pH was not used to determine the probable class of use since it is relatively easily treatable.

Table 6-3. Comparison with EPA Standards

Well ID	Parameters Exceeding Primary MCLs	Parameters Exceeding Secondary MCLs[1]
OZ	Uranium, gross alpha, radium-226 and radium-228	pH, TDS, sulfate, aluminum
PM	Arsenic, uranium, gross alpha, radium-226 and radium-228	pH, TDS, sulfate, aluminum
SM	Gross alpha	Fluoride, pH, TDS, sulfate, aluminum
SA	Uranium, gross alpha	pH, TDS, sulfate, aluminum
DM		pH, TDS, chloride, sulfate, aluminum, iron

[1] EPA designates secondary standards as non-enforceable contaminants that may cause cosmetic or aesthetic effects in drinking water.

Table 6-4. Mine Unit 1 Proposed TRVs

Parameter	Units	95% UTL[1]	Table 5C Value[2]	Proposed TRV[3]
Alkalinity, Total as $CaCO_3$	mg/L	630	---	630
Ammonia as N	mg/L	0.7	---	0.7
Fluoride	mg/L	0.5	---	0.5
Silica as SiO2	mg/L	9.6	---	9.6
Conductivity, Laboratory	µmhos/cm	3,545	---	3,545
pH, Laboratory	s.u.	9.4	---	9.4
Nitrate/Nitrite as N	mg/L	1.0	---	1.0
Total Dissolved Solids, TDS	mg/L	2,485	---	2,485
Calcium	mg/L	11	---	11
Magnesium	mg/L	5	---	5
Potassium	mg/L	16	---	16
Sodium	mg/L	849	---	849
Bicarbonate	mg/L	714	---	714
Carbonate	mg/L	78	---	78
Chloride	mg/L	17	---	17
Sulfate	mg/L	1,343	---	1,343
Aluminum, dissolved	mg/L	0.2	---	0.2
Arsenic, dissolved	mg/L	0.005	0.05	0.05
Barium, dissolved	mg/L	0.5	1.0	1.0
Boron, dissolved	mg/L	0.5	---	0.5
Cadmium, dissolved	mg/L	0.002	0.01	0.01
Chromium, dissolved	mg/L	0.01	0.05	0.05
Copper, dissolved	mg/L	0.01	---	0.01
Iron, dissolved	mg/L	0.08	---	0.08
Mercury, dissolved	mg/L	0.001	0.002	0.002
Manganese, dissolved	mg/L	0.03	---	0.03
Molybdenum, dissolved	mg/L	0.02	---	0.02
Nickel, dissolved	mg/L	0.01	---	0.01
Selenium, dissolved	mg/L	0.005	0.01	0.01
Uranium, dissolved	mg/L	0.23	---	0.23
Vanadium, dissolved	mg/L	0.03	---	0.03
Zinc, dissolved	mg/L	0.01	---	0.01
Radium-226, dissolved	pCi/L	260	5[4]	260
Radium-228, dissolved	pCi/L	2.0	---	2.0
Gross Alpha	pCi/L	717	15	717

[1] Upper tolerance limit (UTL) calculated based on average pre-operational water quality and variability in each parameter at 95% confidence level.

[2] 10 CFR Part 40, Appendix A, Table 5C maximum contaminant level.

[3] Proposed target restoration values (TRVs) are the proposed groundwater protection standards established pursuant to license condition 10.6 of SUA-1601 and 10 CFR Part 40, Appendix A, Criterion 5B(5).

[4] Table 5C value is for combined radium-226 and 228.

Table 6-5. Mine Unit 1 Proposed UCLs

Parameter	Units	Proposed UCL
Perimeter Monitor (PM)		
Alkalinity, Total as $CaCO_3$	mg/L	885
Conductivity, Laboratory	µmhos/cm	3,269
Chloride	mg/L	21
Shallow Monitor (SM)		
Alkalinity, Total as $CaCO_3$	mg/L	896
Conductivity, Laboratory	µmhos/cm	2,873
Chloride	mg/L	19
Deep Monitor (DM)		
Alkalinity, Total as $CaCO_3$	mg/L	931
Conductivity, Laboratory	µmhos/cm	5,168
Sulfate	mg/L	1,692
Shallow Alluvium (SA)		
Alkalinity, Total as $CaCO_3$	mg/L	To be provided 1st Quarter 2016
Conductivity, Laboratory	µmhos/cm	
Chloride	mg/L	

7.0 TOPSOIL STRIPPING AND MANAGEMENT

Topsoil stripping for wellfield construction will be limited to areas around module buildings/well houses, secondary access roads, mud pits for well drilling and installation, and utility trenches. The locations of topsoil stockpiles for MU1 are shown on Figure 7-1. Topsoil handling procedures described in Mine Plan Section 2.4 will be followed.


Sec 7 T53N R67W
Sec 18 T53N R67W
Oshoto Connection
oad
4250
4240
4230
4220
4210
4200
4190
4180
4170
4160
4150
4140
4120
4110
4130
MU1-PM01
MU1-PM02
MU1-PM03
MU1-PM04
MU1-PM05
MU1-PM06
MU1-PM07
MU1-PM08
MU1-PM09
MU1-PM10
MU1-PM11
MU1-PM12
MU1-PM13
MU1-PM14A
MU1-PM15
MU1-PM16
MU1-PM17
MU1-PM18
MU1-PM19
Topsoil Stockpile 1
Topsoil Stockpile 4
Topsoil Stockpile 5
Topsoil Stockpile 6
MU1-OZ26
MU1-DM05
MU1-OZ14
MU1-SM05
MU1-DM14
MU1-SM14
MU1-OZ15
MU1-OZ16
MU1-OZ02
MU1-DM08
MU1-SM08
MU1-OZ18
MU1-OZ20
MU1-OZ17
MU1-DM09
MU1-SM09
MU1-DM07
MU1-SM07
MU1-OZ21
MU1-DM06
MU1-SM06
MU1-OZ25
MU1-OZ07
MU1-OZ08
MU1-DM03A
MU1-DM01
MU1-OZ01
MU1-SM01
MU1-OZ24
MU1-OZ10
MU1-OZ03
MU1-SM03
MU1-DM04
MU1-OZ04
MU1-SM04
MU1-DM02
MU1-SM02
MU1-OZ06
MU1-OZ09
MU1-OZ11
MU1-OZ12
MU1-DM12
MU1-OZ23
MU1-SM12
MU1-DM11
MU1-SM11
MU1-OZ19
MU1-DM10
MU1-DM13
MU1-SM13
MU1-OZ13
MU1-SA03
MU1-OZ31
MU1-SM10
MU1-SA02
MU1-OZ22
MU1-SA01
Estimated Topsoil Removal
3207 yd3 Currently Removed
1913 yd3 Additional Planned Removal
5120 yd3 Total
10 Foot Contours from May 2010 Flight
STRATA ENERGY INC
A WHOLLY-OWNED SUBSIDIARY OF PENINSULA ENERGY LIMITED
Mine Unit 1 Boundary
Installed Monitor Wells
Topsoil Stockpiles
Planned Topsoil Removal and Salvage
Topsoil Removed and Salvaged
Area of Mining Wells
N
0 100 200 300
Feet
1 Inch = 300 Feet
Figure 7-1
Mine Unit 1: Topsoil Removal and Stockpile Locations
REVISIONS
Date Description
Drawn: June 2, 2015
Drawn By: SC
Checked By: JCH
Source: O:\Mining\MU_1_Well_Field_Package\MU1_TopsoilPiles.mxd

8.0 CONCLUSIONS

This wellfield data package fulfills Strata's commitments to provide additional information under Strata's NRC license (SUA-1601) and WDEQ/LQD Permit to Mine (No. 802). Baseline water quality conditions as well as geologic and hydrologic conditions within MU1 have been adequately documented through monitor wells constructed at appropriate spacing within the OZ aquifer, the SM aquifer, and the DM interval. The MU1 wellfield will be located within the previously reclassified and exempted area for the Ross ISR Project.

Detailed geologic isopach and structure contour maps developed for MU1 demonstrate that the shales overlying and underlying the OZ aquifer are continuous throughout MU1 and geologically confine the OZ aquifer. Aquifer testing conducted within MU1 further demonstrates that, with one exception at MU1-SM12, the OZ aquifer is not in hydraulic communication with either the overlying or underlying intervals. Based on aquifer tests conducted in the vicinity of MU1-SM12, the source of communication is attributed to an unlocatable drill hole(s). Additional site-specific groundwater modeling in this area demonstrates that the significantly higher head in the overlying SM aquifer relative to that in the OZ aquifer will minimize the risk of an excursion into the SM aquifer. Nevertheless, Strata will install a pressure transducer in MU1-SM12 to continuously monitor water levels in the well. In addition to the bi-monthly sampling during operational excursion monitoring, Strata will download and evaluate the water level data on a weekly basis when operations in that module area begin. In the event that water level trends measured in the monitor well demonstrate the potential for vertical migration, operational adjustments will be made to limit the potential for a vertical excursion.

The geologic cross sections demonstrate that throughout most of MU1 the OZ sands are relatively consistent. However, within the southeastern portion of MU1 a series of thinner, more silty sandstones with thicker shales can be seen on the cross sections. Aquifer testing conducted within MU1

demonstrates that this zone of thicker shale has a lower hydraulic conductivity than the OZ aquifer outside of this zone. The area of low permeability is likely due to two separate channel systems within the ore zone sandstone locally isolated by floodplain mudstones and thinner, lower permeability sands. The area of low permeability hydrologically separates a small area in the southeastern portion of MU1 from the remainder of the mine unit. Wellfield simulations demonstrate that uranium ISR operations can be safely conducted on both sides of the area of low permeability identified in the geologic cross sections and aquifer tests. Wellfield patterns will be adjusted to accommodate the low permeability area.

Aquifer tests conducted within MU1 demonstrate that the PM wells are in communication with the OZ wells, and with the exception of the minor response observed in MU1-SM12, no communications were observed between the OZ aquifer and the overlying and underlying intervals. Data from multiple observation wells completed in the OZ aquifer were used to estimate hydraulic parameters of the OZ aquifer throughout MU1. The aquifer parameters calculated from the aquifer tests demonstrate that outside the zone of low permeability the OZ aquifer parameters are generally consistent across MU1.

Additional analyses conducted on the DM monitor wells installed in MU1 demonstrate that the DM interval is not an aquifer. The average estimated yield of the 14 wells completed in the DM interval is 0.06 gpm, which is below the threshold used by WDEQ and EPA to classify an aquifer. The DM well logs demonstrate that the DM interval is the only sand within 50 feet of the bottom of the OZ aquifer. Since the interval is not an aquifer or USDW, Strata will seek to amend SUA-1601 and revise Permit to Mine No. 802 in order to allow more flexibility in assessing and eventually monitoring the underlying interval in the excursion monitoring program. Until the license is amended and the permit revised, Strata commits to twice monthly (semi-monthly) operational excursion monitoring of the DM interval consistent with LC 11.5 and Mine Plan Section 5.9.1. Following license amendment and permit revision approvals,

Strata plans to discontinue excursion monitoring in the DM interval and plug and abandon the MU1 DM monitor wells.

Site-specific groundwater modeling demonstrates that ISR operations can be safely conducted within MU1. The modeling confirms that bleed rates ranging from 0.5 up to 2.0 percent are sufficient to maintain an inward hydraulic gradient in the wellfield. The modeling also demonstrates that the proposed 7-spot hexagon wellfield patterns are expected to provide added wellfield control over the 5-spot patterns simulated previously since the injection is spread out over more wells. Given the fact that the calibrated MU1 Groundwater Model largely has similar properties for the OZ aquifer (thickness, hydraulic conductivity, and specific storage) as the Ross Groundwater Model, previous analyses performed in the Ross Groundwater Model (such as the excursion analysis) are considered valid for MU1.

Pre-operational background groundwater sampling was completed for the OZ, PM, SM, and DM intervals in April through June 2015. Four samples were collected from each monitor well, with samples spaced at least 14 days apart. In addition, two quarters of sampling have been completed for three SA wells installed in the saturated unconsolidated alluvium in the southern extents of MU1. Strata commits to collecting two additional quarterly samples from the SA wells to meet the license requirement to collect one year of pre-operational background water quality, with the sample results and UCLs to be provided in 1st Quarter 2016. Operational excursion monitoring of the SA wells in MU1 will be conducted quarterly. In the event of a leak, spill, or shallow integrity failure in an injection well in the area of the saturated alluvium, Strata commits to semi-monthly monitoring until it can be proven that the leaked fluids did not reach the saturated alluvium.

Sampling procedures included purging an adequate volume of water and verifying field water quality parameter stability to obtain representative samples from the formation and using field water quality parameters to verify

that representative samples were collected. A QA/QC evaluation demonstrates the validity of sample data.

A multi-step process was used to screen for potential outliers. This included visual screening, formal statistical testing, and evaluation of statistical outliers to determine whether to remove them from the data set prior to calculating TRVs and UCLs. The outlier evaluation results show that most constituents within each monitoring interval are normally distributed and there are few outliers. This supports the conclusion that the OZ aquifer and most other monitoring intervals are relatively homogenous within MU1.

Sampling results show that the water in the OZ aquifer is likely Class IV (industrial use) only. Most OZ and PM monitor wells exceeded numerous WDEQ/WQD class of use standards and EPA primary MCLs and secondary standards. The OZ wells had the highest uranium and radionuclide concentrations of all monitoring intervals. The average chloride concentration in the DM interval was more than 70 times higher than that in the OZ wells, supporting the decision to use sulfate rather than chloride as an excursion monitoring parameter in the DM interval.

Proposed TRVs were calculated consistent with methods recommended in ASTM D6312-98 and WDEQ/LQD Guideline 4. Upper tolerance limits (UTLs) were calculated for each constituent in Table 5.7-2 of the approved license application (with proposed revisions) after screening for outliers and determining the approximate data distribution. For constituents reasonably described by a normal distribution, two calculation methods were used, including use of EPA ProUCL software and the WDEQ/LQD Guideline 4 tolerance limit method. For constituents reasonably described by a lognormal distribution and for those without a defined distribution (i.e., due to low detection frequency), ProUCL was used to calculate lognormal or non-parametric UTLs. The proposed groundwater protection standards established pursuant to LC 10.6 of SUA-1601 (TRVs) were calculated as the UTL or 10 CFR

Part 40, Appendix A, Table 5C maximum contaminant level, whichever is higher.

UCLs were calculated for the excursion monitoring parameters, including chloride, conductivity, and total alkalinity for the PM and SM intervals and sulfate, conductivity, and total alkalinity for the DM interval. After removing outliers, UCLs were calculated in accordance with LC 11.4 of SUA-1601 as the average pre-operational background concentration plus 5 standard deviations (or, in the case of chloride, plus the larger of 5 standard deviations or 15 mg/L).

Consistent with the approved permit, topsoil management will be limited to areas around module buildings/well houses, secondary access roads, mud pits for well drilling and installation, and utility trenches.

9.0 REFERENCES

ASTM International (ASTM), 2012, Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs, ASTM D6312-98, updated in 2005 with editorial changes added in 2012.

Cooper, H.H., Jr., and C.E. Jacob, 1946, A generalized graphical method for evaluating formation constants and summarizing well field history, Trans. Amer. Geophysical Union, Vol. 27 pp. 526-534.

EPA, 2002, Technical Program Overview: Underground Injection Control Regulations, Office of Water 4606, EPA 816-R-02-025, December 2002.

EPA, 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance, EPA 530/R-09-007, March 2009.

EPA, 2013, ProUCL Version 5.0.00 Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations, EPA Office of Research and Development, September 2013.

Hamilton, J.L., 1977. Hydrologic Information Vicinity Proposed In-Situ Uranium Leaching Site Oshoto, Wyoming. Unpublished report prepared for Nuclear Dynamics, August 30, 1977.

Manera, P.A., 1978, Aquifer Analysis Area 10 Five Spot Test, Oshoto Reservoir, Crook County, Wyoming. Unpublished report prepared for Nuclear Dynamics, June 5, 1978

Manera, P.A., 1977, Aquifer Analysis Near Oshoto Reservoir, Crook County, Wyoming. Unpublished report prepared for Nuclear Dynamics, revised November 22, 1977.

NRC, 2014, Safety Evaluation Report for the Strata Energy, Inc. Ross ISR Project, Crook county, Wyoming, Materials License No. SUA-1601, January 2014. NRC Adams Accession No. ML14002A107.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Trans. Amer. Geophys. Union, Vol. 16, pp. 519-524.

WWC Engineering, 2010 Ross Area Aquifer Pump Test Results. Included as Addendum 2.7-F to the Technical Report for the NRC SUA-1601 Ross License and LQD Permit No. 802 Addendum D6-7 of Appendix D6.