Environmental
Management
Nevada Program

DOE/EMNV--0028

Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada

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CALENDAR YEAR 2020 POST-CLOSURE MONITORING REPORT FOR CORRECTIVE ACTION UNIT 99: RAINIER MESA/SHOSHONE MOUNTAIN, UNDERGROUND TEST AREA, NEVADA NATIONAL SECURITY SITE, NEVADA

U.S. Department of Energy, Environmental Management Nevada Program
Las Vegas, Nevada

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Approved by: TIFFANY GAMERO Digitally signed by TIFFANY GAMERO Date: 2021.07.27 09:04:53 -07'00' Date: _____

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List of Acronyms and Abbreviations

General Acronyms and Abbreviations

amsl	Above mean sea level
bgs	Below ground surface
CAS	Corrective action site
CAU	Corrective action unit
CR	Closure report
CS	Carbon-steel
CY	Calendar year
DOE	U.S. Department of Energy
DRI	Desert Research Institute
ETDS	E-Tunnel Wastewater Disposal System
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
ESP	Electric submersible pump
FD	Field duplicate
FFACO	*Federal Facility Agreement and Consent Order*
FI	Field instruction
FMP	Fluid Management Plan
ft	Foot
F&S	Fenix & Scisson
gal	Gallon
gpm	Gallons per minute
HSU	Hydrostratigraphic unit
ID	Identification
in.	Inch
ISPID	Integrated Sampling Plan Identifier
IT	IT Corporation
Lat	Latitude
Long	Longitude
m	Meter

List of Acronyms and Abbreviations (Continued)

MCL	Maximum contaminant level
MDC	Minimum detectable concentration
MDL	Method detection limit
mg/L	Milligrams per liter
M&O	Management and operating
N/A	Not applicable
NA	Not available
NAD	North American Datum
NDEP	Nevada Division of Environmental Protection
NDWR	Nevada Division of Water Resources
NM	Not measured
NNSA/NFO	U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office
NNSS	Nevada National Security Site
NSPC	Nevada State Plane Coordinates
NSTec	National Security Technologies, LLC
NTU	Nephelometric turbidity unit
pCi/L	Picocuries per liter
PXD	Pressure transducer
RBMS	Requirements-Based Management System
REECo	Reynolds Electrical & Engineering Co., Inc.
REOP	Real Estate/Operations Permit
RM/SM	Rainier Mesa/Shoshone Mountain
RM	Rainier Mesa
RN	Radionuclide
ROTC	Record of technical change
SDWA	*Safe Drinking Water Act*
SEC	Specific electrical conductance
SM	Shoshone Mountain
SNJV	Stoller-Navarro Joint Venture
SS	Stainless-steel

List of Acronyms and Abbreviations *(Continued)*

SU	Standard unit
UDI	United Drilling, Inc.
UGTA	Underground test area
UR	Use restriction
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WPC	Water Pollution Control
°C	Degrees Celsius
µS/cm	Microsiemens per centimeter

Stratigraphic, Hydrostratigraphic, Hydrogeologic, and Lithologic Unit Abbreviations and Symbols

AA	Alluvial aquifer
ATCU	Argillic tuff confining unit
ATWTA	Ammonia Tanks welded-tuff aquifer
BRA	Belted Range aquifer
BRCU	Belted Range confining unit
CZw	Wood Canyon Formation
Dg	Guilmette Formation
Ds	Simonson Formation
DSs	Sevy Dolomite
FCCM	Fortymile Canyon composite unit
FCLMLFA	Fortymile Canyon lower mafic lava-flow aquifer
LCA	Lower carbonate aquifer
LCA3	Lower carbonate aquifer 3 - thrust plate
LCCU	Lower clastic confining unit
LTCU	Lower tuff confining unit
LTCU1	Lower tuff confining unit 1
LVTA	Lower vitric-tuff aquifer
LVTA1	Lower vitric-tuff aquifer 1

List of Acronyms and Abbreviations (Continued)

Mc	Chainman Shale
MDe	Eleana Formation
MGCU	Mesozoic granite confining unit
Oaa	Antelope Valley Limestone
OSBCU	Oak Spring Butte confining unit
PVTA	Paintbrush vitric-tuff aquifer
Pz	Paleozoic (undivided)
QTa	Quaternary/Tertiary alluvium
RMWTA	Rainier Mesa welded-tuff aquifer
RVA	Redrock Valley aquifer
Tbd	Dead Horse Flat Formation
Tbg	Grouse Canyon Tuff
Tbgb	Bedded Grouse Canyon Tuff
Tbgp	Grouse Canyon crystal-poor Tuff
Tbgr	Grouse Canyon crystal-rich Tuff
Tbq	Comendite of Quartet Dome
Tc	Crater Flat Group
TCA	Tiva Canyon aquifer
Tcbs	Bullfrog Tuff, Stockade Wash Lobe
TCVA	Thirsty Canyon volcanic aquifer
Tfbb	Basalt of Chukar Canyon
Tfdb	Basalt of Dome Mountain
Tfbw	Rhyolite of Beatty Wash
Tfbr	Rhyolite of Chukar Canyon
Tfbw	Rhyolite of Beatty Wash
Tg	Pliocene through Oligocine alluvium
Th	Calico Hills Formation
THCU	Tannenbaum Hill confining unit
Tl	Paleocolluvium
Tln	Paleocolluvium, nontuffaceous
Tlt	Tuffaceous paleocolluvium

List of Acronyms and Abbreviations (Continued)

Tmab	Ammonia Tanks bedded tuff
Tmac	Tuff of Crooked Canyon
Tmap	Mafic-poor Ammonia Tanks Tuff
Tmar	Mafic-rich Ammonia Tanks Tuff
TMLVTA	Timber Mountain lower vitric-tuff aquifer
Tmrb	Rainier Mesa bedded tuff
Tmrh	Tuff of Holmes Road
Tmrp	Mafic-poor Rainier Mesa Tuff
Tmrr	Mafic-rich Rainier Mesa Tuff
TMWTA	Timber Mountain welded-tuff aquifer
Tn	Tunnel Formation
Tn3A	Beds 3A Tunnel Formation
Tn3BC	Beds 3BC Tunnel Formation
Tn3bcd	Beds 3B - D Tunnel Formation
Tn3D	Beds 3D Tunnel Formation
Tn3&4	Tunnel bed 3 and 4
Tn4abcde	Beds 4A - E Tunnel Formation
Tn4AF	Beds 4A - F Tunnel Formation
Tn4F	Beds 4F Tunnel Formation
Tn4G	Beds 4G Tunnel Formation
Tn4H	Beds 4H Tunnel Formation
Tn4J	Beds 4J Tunnel Formation
Tn4K	Beds 4K Tunnel Formation
To	Volcanics of Oak Spring Butte
Toh	Rhyolite of the Hump
Ton1	Tunnel bed 1
Ton2	Tunnel bed 2
Ton2/Toy	Tunnel bed 2/Yucca Flat Tuff
Tor	Redrock Valley Tuff
Tot	Tuff of Twin Peaks
Toy	Yucca Flat Tuff

List of Acronyms and Abbreviations *(Continued)*

Tp	Paintbrush Group, undivided
Tpc	Tiva Canyon Tuff
Tpt	Topopah Spring Tuff
Trl	Lithic Ridge Tuff
TSA	Topopah Spring aquifer
Ttp	Pahute Mesa Tuff
Ttt	Trail Ridge Tuff
Tub	Tub Spring Tuff
Tv	Tertiary volcanics
Tw	Wahmonie Formation
UCCU	Upper clastic confining unit
UTCU1	Upper tuff confining unit 1

Symbols for Elements and Compounds

Ag	Silver
As	Arsenic
Ba	Barium
C	Carbon
Cd	Cadmium
Cl	Chlorine
Cr	Chromium
^{3}H	Tritium
Hg	Mercury
I	Iodine
Pb	Lead
Pu	Plutonium
Se	Selenium
Sr	Strontium
Tc	Technetium

1.0 Introduction

This report presents the results of monitoring conducted for water quality, water levels, and institutional controls in calendar year (CY) 2020 by the U.S. Department of Energy (DOE), Environmental Management (EM) Nevada Program's Underground Test Area (UGTA) Activity at Corrective Action Unit (CAU) 99, Rainier Mesa/Shoshone Mountain (RM/SM), at the Nevada National Security Site (NNSS), Nevada (Figure 1-1). This report also presents analytical laboratory results (including results of quality assurance/quality control samples, such as field duplicates [FDs]), and verification of use restrictions (URs), institutional controls, and water usage. Groundwater samples were collected; water levels were measured; and well site surveillance was conducted in support of the *Underground Test Area Closure Report* (CR) *for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada* (DOE/EMNV, 2020).

Rainier Mesa (RM) was the site of 61 underground nuclear tests, and Shoshone Mountain (SM) was the site of 6 underground nuclear tests. As a result of these activities, which took place from 1957 to 1992, radionuclides (RNs) were released in the subsurface in the vicinity of the detonations. These 67 underground nuclear tests are associated with 66 specific corrective action site (CAS) numbers, as listed in the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended). Two tests, HURON LANDING and DIAMOND ACE (conducted simultaneously), are included within one CAS. Figures 1-2 and 1-3 show the underground nuclear test locations on RM and SM, respectively.

The CR (DOE/EMNV, 2020) establishes the regulatory boundaries and regulatory boundary objectives, monitoring program, UR boundaries and URs, and other institutional controls agreed to by EM Nevada Program and the Nevada Division of Environmental Protection (NDEP) for closure of CAU 99. Regulatory boundaries for the RM/SM CAU were established to protect receptors of groundwater from RN contamination within the three downgradient groundwater basins that receive recharge from RM. The SM regulatory boundary was established to verify that RN contamination does not reach the lower carbonate aquifer below SM. The UR boundaries were established based on contaminant simulation forecasts from the flow and transport simulations with consideration of site-specific topographical controls. The URs associated with the UR boundaries were identified to protect onsite workers and the public from inadvertent exposure to contaminated groundwater as forecasted to occur assuming current conditions. The UR is intended to restrict activities that might

expose workers to contaminated groundwater within the UR area. In addition to the URs, other institutional controls are established to monitor and limit access to groundwater. These include federal ownership and management in perpetuity, controlled access of the NNSS and surrounding areas, and reporting water use on the NNSS and surrounding hydrographic basins.

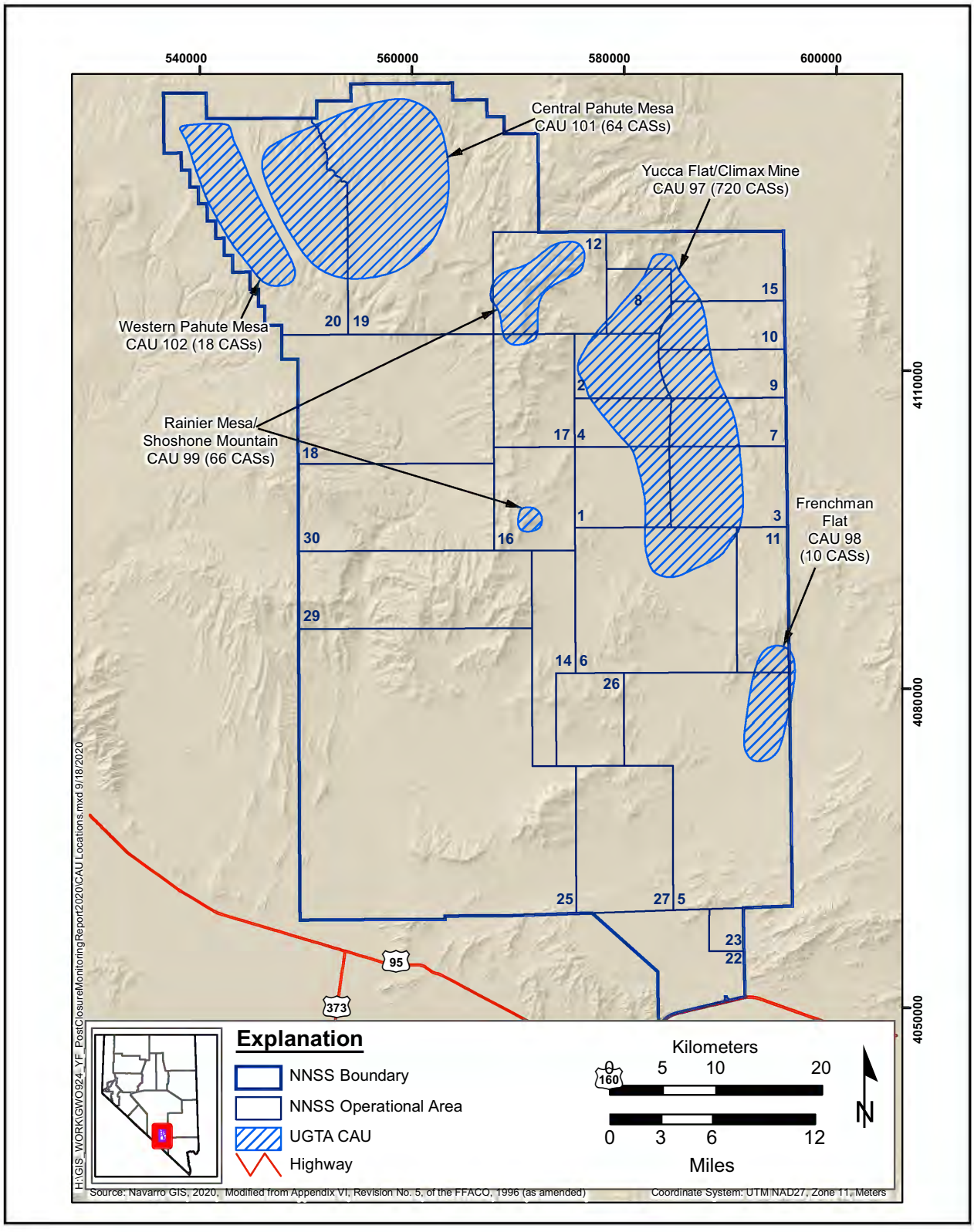

Figure 1-1
NNSS Site Map and UGTA CAU Locations

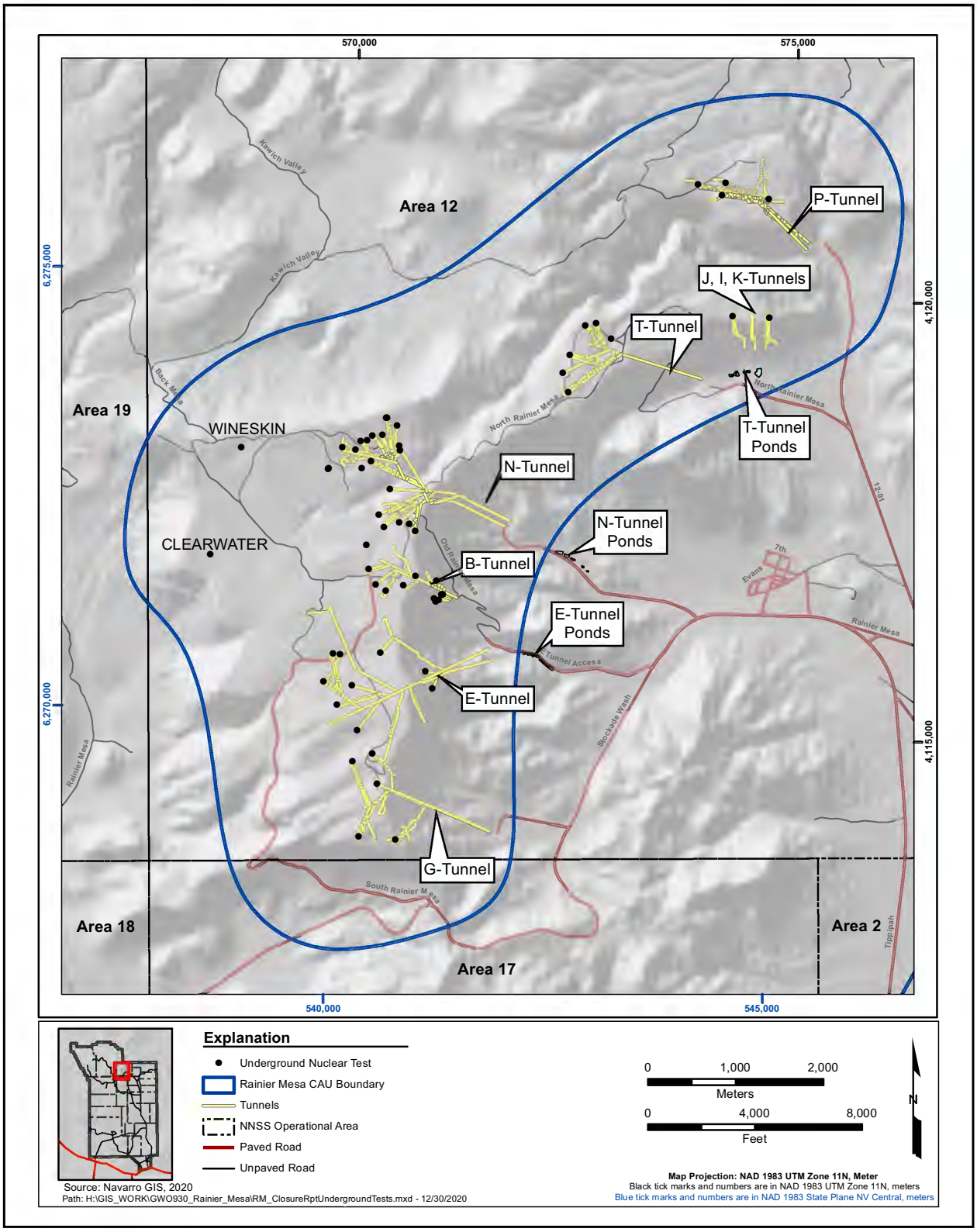

Figure 1-2
RM Underground Nuclear Test Locations

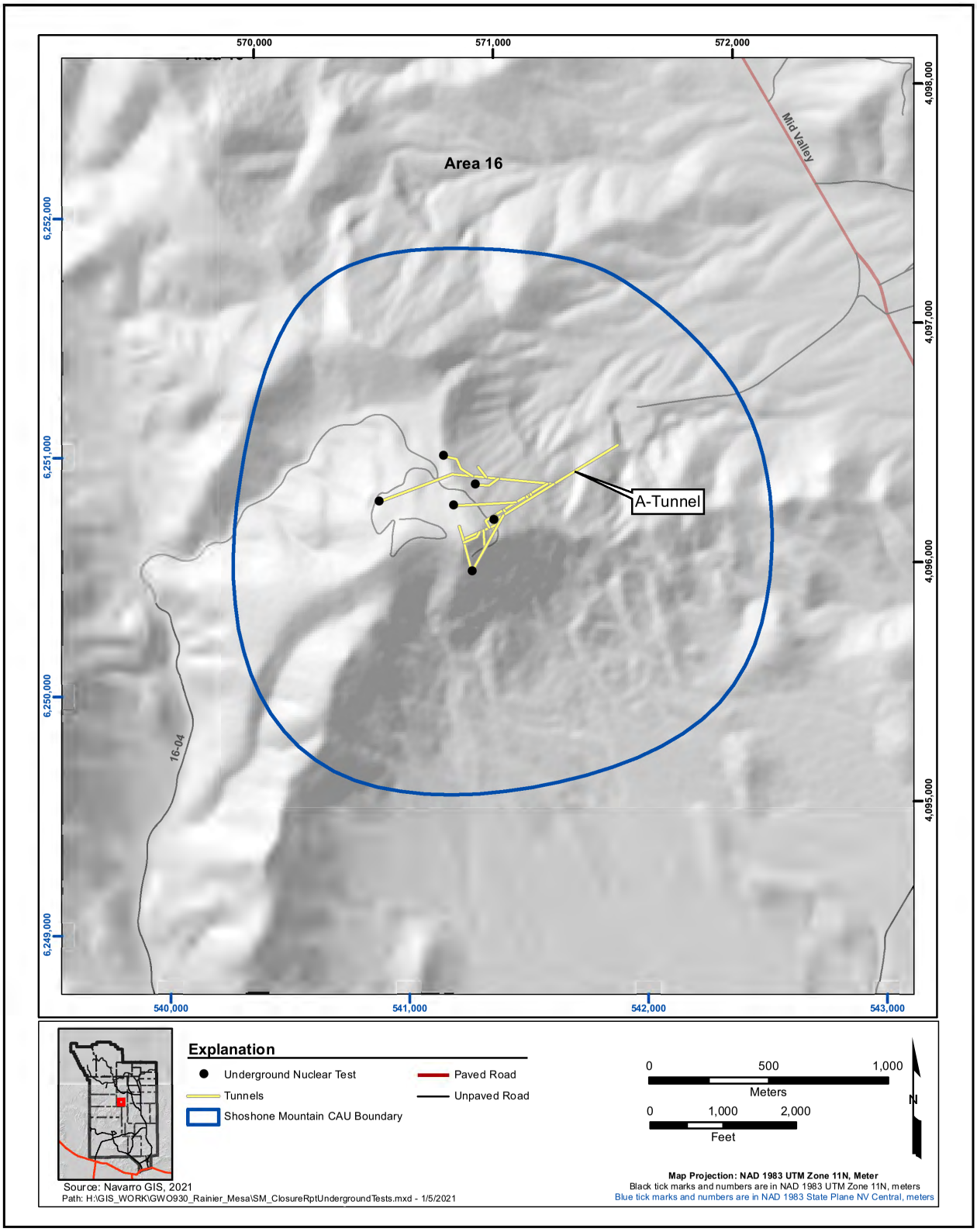

Figure 1-3
SM Underground Nuclear Test Locations

2.0 Well Sampling/Water-Level Measurements

Three types of monitoring are performed for CAU 99: water quality, water level, and institutional control. The objective of all these monitoring activities is to determine whether the UR remains protective of human health and the environment, and to ensure that the regulatory boundary objective is met.

Twelve wells with 14 completions in the RM/SM network are sampled every six years for water-quality monitoring (Figure 2-1). Water-quality sampling in CY 2020 was conducted by Navarro in accordance with the Field Instruction (FI) for the UGTA Activity for Well Development and Testing, and Groundwater Sampling (Navarro, 2016), its ensuing Record of Technical Change (ROTC) (Navarro, 2017), and applicable Navarro Requirements-Based Management System (RBMS) procedures and desktop instructions (Navarro, 2020a). These wells, listed in the order in which they were sampled in CY 2020, are described in detail in Sections 2.1.1 through 2.1.12.

Seven wells and two vent holes, with a total of nine completions, are in the post-closure water-level monitoring network and are measured annually. Some of the water-level measurements are obtained from wells that are also groundwater sampling locations (Figure 2-2).

Water-level measurements are obtained by three different methods:

- By Navarro at the time of sample collection using water-level instruments in accordance with the FI (Navarro, 2016), its ensuing ROTC (Navarro, 2017), and applicable Navarro RBMS procedures and desktop instructions (Navarro, 2020a).
- By the U.S. Geological Survey (USGS) using water-level instruments in accordance with USGS procedures. These measurements are posted to the USGS Groundwater Levels for the Nation, National Water Information System web page (USGS, 2021).
- Calculated from the long-term water-level monitoring pressure transducer (PXD) data. When PXDs are installed in completions to obtain continuous water-level measurements, water levels cannot be physically measured because the PXD prevents access to the completion.

For the purposes of annual water-level reporting, the preference is to use the USGS measurements. However, in a few wells, USGS data are not available because a PXD prevents access to the completion, or the well may have contamination that exceeds USGS limits for safe access. In those

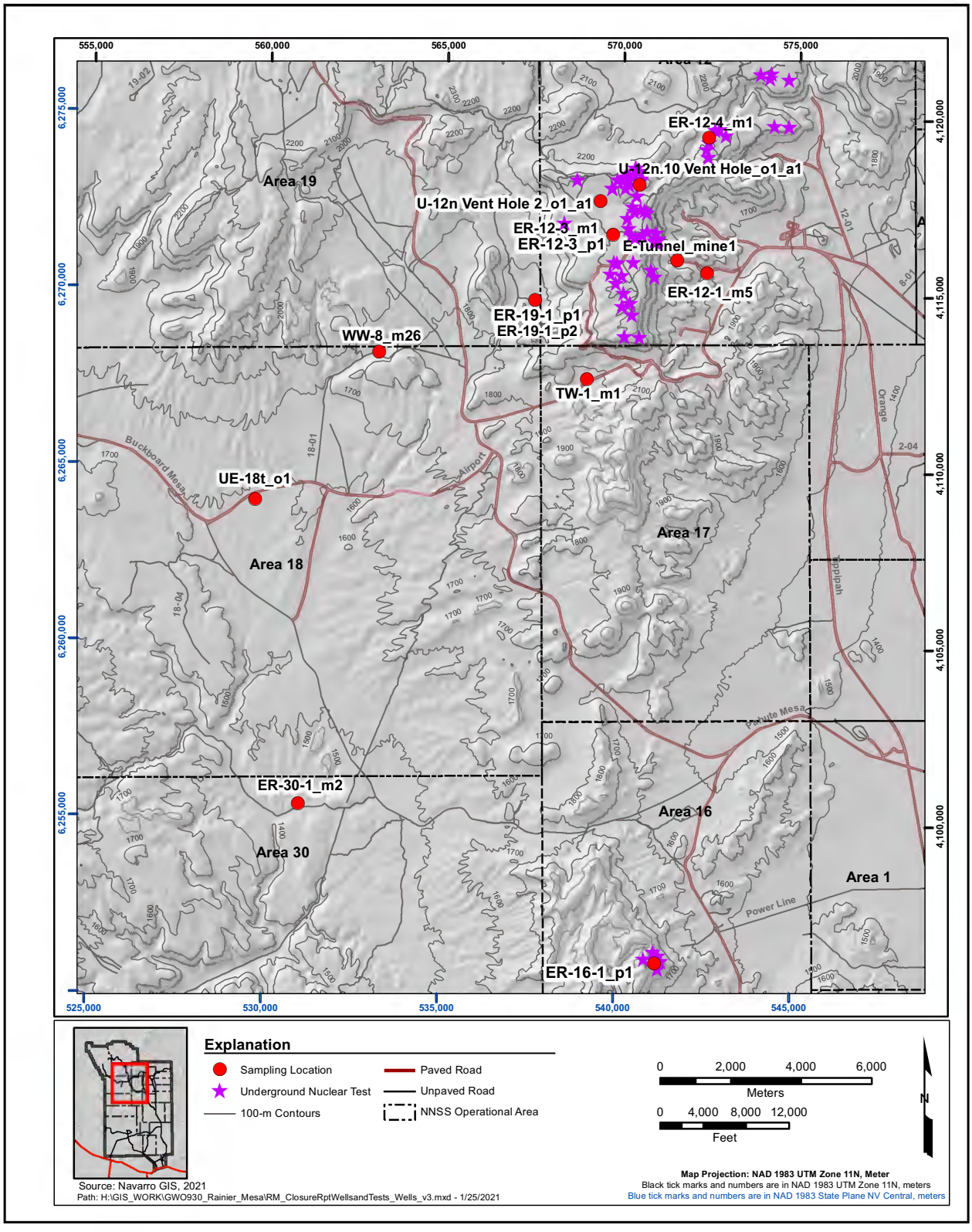

Figure 2-1
Sampling Locations for RM/SM CAU

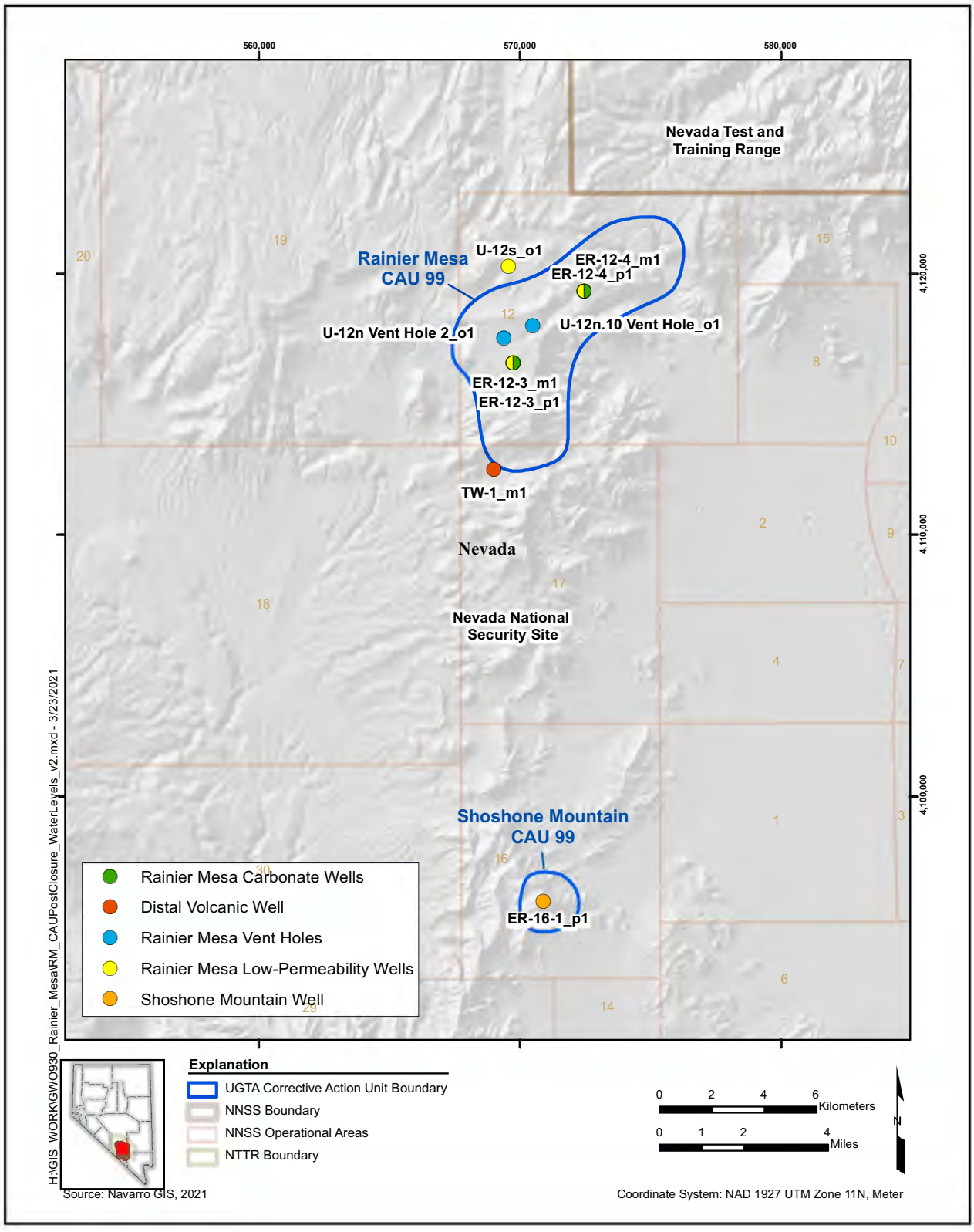

Figure 2-2
RM/SM Water-Level Monitoring Locations

cases, measurements made by Navarro during sampling activities, or data obtained from downhole PXDs are used. Where non-USGS data are used in this report, they are identified (Table 2-17).

2.1 Water-Quality Sampling

Water-quality samples were collected by Navarro, unless otherwise noted, from each of the wells and locations. Field water-quality parameters, purge volumes, and flow rates at the time of sample collection are provided in Table 2-1.

Table 2-1
Purge Volumes and Field Water-Quality Data
(Page 1 of 2)

Well and ISPID	Date	Volume (gal)	Flow Rate (gpm)	Temp (°C)	pH (SU)	SEC (µS/cm)	Turbidity (NTU)
ER-12-3_m1 [a]	07/23/2020	34,420	22.3	29.5	8.283	258	0.44
ER-12-4_m1 [a]	08/03/2020	34,014	3.87	26.7	8.491	204	1.07
ER-30-1_m2 [b]	08/11/2020	N/A	N/A	24.2	9.033	332	80.4
UE-18t_o1 [b]	08/13/2020	N/A	N/A	30.1	9.009	277	4.86
ER-12-1_m5 [c]	08/18/2020	8,463	NM	25.4	7.4	992	NM
E-Tunnel_mine1 [d]	08/18/2020	N/A	NM	18.0	7.338	370	10.1
ER-12-3_p1 [b]	08/24/2020	N/A	N/A	19.6	8.34	233	>1,000
WW-8_m26 [c]	08/25/2020	288,000	200	26.0	7.1	206.2	1.75
ER-19-1_p1 [b]	09/01/2020	N/A	N/A	23.4	11.24	3,950	103
ER-19-1_p2 [b]	09/02/2020	N/A	N/A	22.0	10.123	350	13.7
TW-1_m1 [b]	09/08/2020	N/A	N/A	19.8	9.29	223	2.82
ER-16-1_p1 [b]	09/23/2020	N/A	N/A	23.3	8.884	282	46.2
U-12n.10 Vent Hole_o1_a1 [b]	10/26/2020	N/A	N/A	12.3	10.016	1,045	6.08
	10/27/2020	N/A	N/A	16.0	9.95	1,047	3.37
	10/28/2020	N/A	N/A	18.7	9.93	1,045	3.74
	10/29/2020	N/A	N/A	18.7	9.955	1,039	6.18

Table 2-1
Purge Volumes and Field Water-Quality Data
(Page 2 of 2)

Well and ISPID	Date	Volume (gal)	Flow Rate (gpm)	Temp (°C)	pH (SU)	SEC (µS/cm)	Turbidity (NTU)
U-12n Vent Hole 2_o1_a1 [b]	11/03/2020	N/A	N/A	16.0	9.097	434	8.57
	11/04/2020	N/A	N/A	17.2	9.151	428	5.66
	11/05/2020	N/A	N/A	18.0	9.189	429	5.90

[a] Sample collected using an electric submersible pump (ESP).
[b] Sample collected with a bailer.
[c] Sample collected by M&O contractor.
[d] Grab sample.

gal = Gallon
gpm = Gallons per minute
ISPID = Integrated Sampling Plan Identifier
M&O = Management and operating
N/A = Not applicable
NM = Not measured
NTU = Nephelometric turbidity unit
SEC = Specific electrical conductance
SU = Standard unit
°C = Degrees Celsius
µS/cm = Microsiemens per centimeter

Standard tritium (^{3}H), carbon-14 (^{14}C), chlorine-36 (^{36}Cl), strontium-90 (^{90}Sr), technetium-99 (^{99}Tc), iodine-129 (^{129}I), isotopic plutonium ($^{238/239/240}Pu$), and fluid management plan (FMP) analyses are performed by commercial laboratories certified by the NDEP Bureau of Safe Drinking Water. Tables 2-2 through 2-15 provide the RN results. As seen in the tables, minimum detectable concentrations (MDCs) of RNs can vary due to the laboratory performing the analyses, count time, instrument, method detection limit studies, and sample volume. Figure 2-3 shows the sample and, where applicable, the FD ^{3}H results for the RM and SM sampling locations.

2.1.1 ER-12-3

ER-12-3 was drilled to a depth of 4,908 feet (ft) below ground surface (bgs) in April 2005. The well was constructed with one main completion (m1) and one piezometer (p1). The m1 completion has two slotted intervals, the upper interval from 3,591.0 to 3,805.79 ft bgs and the lower interval from 4,191.58 to 4,880.0 ft bgs. The m1 completion is open to the lower carbonate aquifer 3 - thrust plate (LCA3). The p1 piezometer is slotted from 1,414.53 to 1,532.49 ft bgs and is open to the lower tuff confining unit (LTCU), the Oak Spring Butte confining unit (OSBCU), and the argillic tuff confining unit (ATCU). Figure A-1 provides a well completion diagram of ER-12-3.

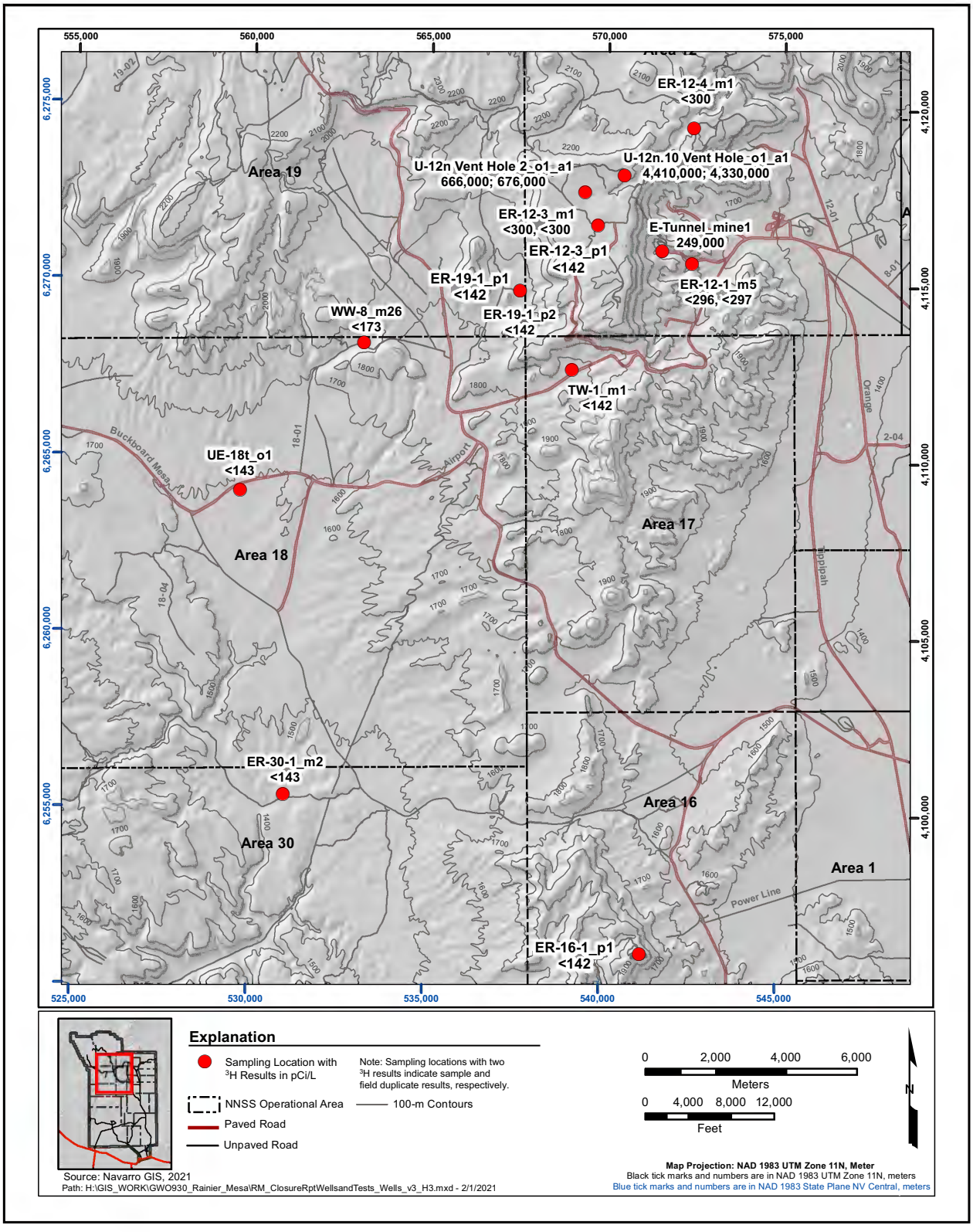

Figure 2-3
RM/SM ^{3}H Sampling Results

2.1.1.1 ER-12-3_m1

The water level was measured in the m1 pump tubing by Navarro before turning on the ESP. The well was purged before collecting groundwater samples from ER-12-3_m1. Purge volumes and field water-quality parameters are presented in Table 2-1. A ^{3}H sample and FD sample were collected on July 23, 2020. The ^{3}H results were below the MDC of 300 picocuries per liter (pCi/L) in both the sample and FD; the results are presented in Table 2-2.

Table 2-2
ER-12-3_m1 ^{3}H Sampling Results

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-12-3	ER-12-3_m1	07/23/2020	<300 | <300

Notes:
(1) The symbol "|" reports the sample and FD results.
(2) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.1.2 ER-12-3_p1

The water level was measured in the p1 piezometer by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on August 24, 2020, from a depth of 1,475 ft bgs. The ^{3}H result was below the MDC of 142 pCi/L, and the result is presented in Table 2-3.

Table 2-3
ER-12-3_p1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-12-3	ER-12-3_p1	08/24/2020	<142

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.2 ER-12-4

ER-12-4 was drilled to a depth of 3,715 ft bgs in June 2005. The well was constructed with one main completion (m1), one piezometer (p1), and an access line (a). The m1 completion slotted interval extends from 3,111.42 to 3,668.74 ft bgs and is open to the LCA3. The access line is slotted from 2,959.62 to 2,974.37 ft bgs and is used to measure the water level in the main completion. The p1 piezometer is slotted from 1,836.15 to 1,967.64 ft bgs and is open to the Belted Range confining unit (BRCU), LTCU, and OSBCU. Figure A-2 provides a well completion diagram of ER-12-4.

The water level was measured in the access line by Navarro before turning on the ESP in the m1 completion. The well was purged before collecting groundwater samples from ER-12-4_m1; purge volumes and field water-quality parameters are presented in Table 2-1. A ^{3}H sample was collected on August 3, 2020. The ^{3}H result was below the MDC of 300 pCi/L, and the result is presented in Table 2-4.

Table 2-4
ER-12-4_m1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-12-4	ER-12-4_m1	08/03/2020	<300

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.3 ER-30-1

Well ER-30-1 was drilled to a total depth of 1,426 ft bgs in March 1994. However, due to severe sloughing problems, the hole was left with 491 ft of fill, leaving a working depth of 935 ft bgs. The well was completed with two completions, m1 and m2. The m1 completion has a slotted interval from 745.4 to 765.4 ft bgs, and the m2 completion has a slotted interval from 587.5 to 607.5 ft bgs. Both completions are open to the Fortymile Canyon composite unit (FCCM). Figure A-3 provides a well completion diagram of ER-30-1.

The water level was measured in both the m1 and m2 completions by Navarro before collecting groundwater samples using a depth-discrete bailer in ER-30-1_m2. The RM/SM CR (DOE/EMNV, 2020) states that samples are to be collected from the m1 completion, but samples were collected from the m2 completion because the Moyno pump in the m1 completion failed, making the m1 completion inaccessible for bailer sampling until the pump could be removed. The Moyno pump in the m2 completion had been removed in August 2017, so the m2 completion was accessible for bailer sampling. On August 10, 2020, EM Nevada Program notified NDEP of the Moyno pump failure and requested agreement that a bailed sample would be collected from the m2 completion instead. NDEP agreed that in this instance, the m2 sample was acceptable, but future sampling of this well needed further evaluation before a long-term solution would be implemented.

Based on process knowledge from a previous sample event, observations indicated the m1 completion may have had a hole allowing groundwater cross-communication between the m1 and m2 completion zones. In December 2020, USGS conducted video logging of the m1 and m2 completions, and confirmed that both completions had holes at approximately 319 ft bgs. The holes in the m1 and m2 completions are located above the water level and within the upper cemented portion of the well. The videos did not show any other holes in the piezometers or other areas where communication between the two piezometers would occur. The condition of the two piezometers in Well ER-30-1 will be evaluated based on process knowledge and the video logging. The future approach to sampling Well ER-30-1 will be jointly evaluated by EM Nevada Program and NDEP.

Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on August 11, 2020, from a depth of 550 ft bgs. The ^{3}H result was below the MDC of 143 pCi/L, and the result is presented in Table 2-5.

Table 2-5
ER-30-1_m2 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-30-1	ER-30-1_m2	08/11/2020	<143

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.4 UE-18t

Well UE-18t was drilled in 1978 as an exploratory core hole to a depth of 2,600 ft bgs. The well was constructed with casing set to a depth of 812 ft bgs within the borehole. Blank tubing was installed within the borehole to a depth of 1,896 ft bgs; coring rods were abandoned in the hole from 1,550 to 1,875 ft bgs between the borehole and tubing. The lower portion of the well from 1,896 to 2,600 ft bgs is an open borehole. The well is open to the FCCM, Ammonia Tanks welded-tuff aquifer (ATWTA), Tannenbaum Hill confining unit (THCU), and Rainier Mesa welded-tuff aquifer (RMWTA). Figure A-4 provides a well completion diagram of UE-18t.

The water level was measured in the tubing by Navarro before collecting groundwater samples using a depth-discrete bailer at UE-18t_o1. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on August 13, 2020, from a depth of 1,165 ft bgs. The ^{3}H result was below the MDC of 143 pCi/L, and the result is presented in Table 2-6.

Table 2-6
UE-18t_o1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
UE-18t	UE-18t_o1	08/13/2020	<143

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.5 ER-12-1

Well ER-12-1 was drilled to a total depth of 3,588 ft bgs in 1991, with well construction activities conducted in 1992. The well is constructed with a single completion with five sliding sleeves (m1 through m5). The uppermost sleeve (m5) extends from 1,757 to 1,761 ft bgs and is open to the upper clastic confining unit (UCCU). The other four sleeves are closed. Figure A-5 provides a well completion diagram of ER-12-1.

Well ER-12-1 was sampled by the M&O contractor; no water level was measured before turning on the ESP in the main completion. The well was purged before collecting groundwater samples from ER-12-1_m5; purge volumes and field water-quality parameters are presented in Table 2-1. A ^{3}H sample and FD sample were collected on August 18, 2020. The ^{3}H results were below the MDCs of 296 pCi/L and 297 pCi/L for the sample and FD, respectively. The results are presented in Table 2-7.

Table 2-7
ER-12-1_m5 ^{3}H Sampling Results

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-12-1	ER-12-1_m5	08/18/2020	<296 | <297

Notes:
(1) The symbol "|" reports the sample and FD results.
(2) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.6 E-Tunnel

Discharge effluent samples are collected directly from the E-Tunnel Wastewater Disposal System (ETDS). Groundwater accumulates within the tunnel and is ultimately discharged from the E-Tunnel portal into the ETDS flume box, then into sequential, earthen-dammed impoundments (ponds). The E-Tunnel has a continuously flowing groundwater discharge that flows at an approximate rate of 6 to 7 gpm.

Field water-quality parameters were measured from the continuous discharge and are presented in Table 2-1. The ^{3}H, ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and $^{238/239/240}Pu$ samples were collected by Navarro on August 18, 2020, from E-Tunnel_mine1. The ^{3}H, ^{36}Cl, ^{238}Pu, and $^{239/240}Pu$ results were above the MDCs, while the ^{14}C, ^{90}Sr, ^{99}Tc, and ^{129}I results were below the MDCs. The results are presented in Table 2-8.

Table 2-8
E-Tunnel_mine1 RN Sampling Results

Well and ISPID	Sample Date	^{3}H	^{14}C	^{36}Cl	^{90}Sr	^{99}Tc	^{129}I	^{238}Pu	$^{239/240}$Pu
		(pCi/L)							
E-Tunnel_mine1	08/18/2020	249,000	<1,950	3.36	<5.92	<8.04	<0.866	0.0931	1.05

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.7 WW-8

Well WW-8 was drilled to a depth of 5,490 ft bgs in 1962 and completed in early 1963. The well was completed with a single completion casing (m26) and a liner. A bridge plug is installed at 1,941 ft bgs and separates the casing from the liner. The m26 completion consists of casing that is perforated from 1,250 to 1,300 ft bgs; 1,450 to 1,500 ft bgs; and 1,630 to 1,780 ft bgs, and is open to approximately 903 ft of the Belted Range aquifer (BRA). Figure A-6 provides a well completion diagram of WW-8.

WW-8 was sampled by the M&O contractor; no water level was measured. The well was purged using the dedicated pump before collecting groundwater samples from WW-8_m26; purge volumes and field water-quality parameters are presented in Table 2-1. A ^{3}H sample was collected on August 25, 2020. The ^{3}H result was below the MDC of 173 pCi/L, and the result is presented in Table 2-9.

Table 2-9
WW-8_m26 ^{3}H Sampling Results

Well	ISPID	Sample Date	^{3}H (pCi/L)
WW-8	WW-8_m26	08/25/2020	<173

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.8 ER-19-1

ER-19-1 was drilled as an exploratory well to a depth of 3,595 ft bgs in 1993. The well was constructed with three completions (m1, m2, and m3) and two piezometers (p1 and p2). The m1 completion has two screened intervals at 3,249.1 to 3,308.8 ft bgs and 3,450.5 to 3,510.2 ft bgs, and is open to the lower clastic confining unit (LCCU). The m2 completion consist of tubing with the slotted interval at a depth of 2,699.5 to 2,720.1 ft bgs. The p1 piezometer is adjacent to the m2 completion. Both the m2 and p1 completions are located within the Redrock Valley aquifer (RVA) and ATCU. The m3 completion consist of tubing with the slotted interval at a depth of 1,360.0 to 1,380.5 ft bgs. The p2 piezometer is adjacent to the m3 completion. Both the m3 and p2 completions are located within the OSBCU. Figure A-7 provides a well completion diagram of ER-19-1.

2.1.8.1 ER-19-1_p1

The water level was measured in the p1 piezometer by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on September 1, 2020, from a depth of 2,707 ft bgs in ER-19-1_p1. The ^{3}H result was below the MDC of 142 pCi/L, and the result is presented in Table 2-10.

Table 2-10
ER-19-1_p1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-19-1	ER-19-1_p1	09/01/2020	<142

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.8.2 ER-19-1_p2

The water level was measured in the p2 piezometer by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on

September 2, 2020, from a depth of 1,370 ft bgs in ER-19-1_p2. The ^{3}H result was below the MDC of 142 pCi/L, and the result is presented in Table 2-11.

Table 2-11
ER-19-1_p2 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-19-1	ER-19-1_p2	09/02/2020	<142

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.9 TW-1

Well TW-1 was drilled to a depth of 4,206 ft bgs from 1960 to 1962. The well is completed with a liner from 1,560 to 3,711 ft bgs. The liner (m1) is perforated at five different depths (1,910 to 1,950 ft bgs; 2,030 to 2,050 ft bgs; 2,100 to 2,160 ft bgs; 2,230 to 2,270 ft bgs; and 2,370 to 2,430 ft bgs). The m1 completion is open to approximately 2,250 ft of the OSBCU, RVA, LTCU1, and ATCU. Figure A-8 provides a well completion diagram of TW-1.

The water level was measured in the m1 casing by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on September 8, 2020, from a depth of 2,130 ft bgs from TW-1_m1. The ^{3}H result was below the MDC of 142 pCi/L and the result is presented in Table 2-12.

Table 2-12
TW-1_m1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
TW-1	TW-1_m1	09/08/2020	<142

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.10 ER-16-1

Well ER-16-1 was drilled in 2005 and was recompleted in August 2006. A 4.75-inch (in.) borehole was advanced from the bottom of the existing casing to a final depth of 4,566 ft bgs. After completion of the well deepening operations, piezometer p1 was installed to a depth of 4,532.31 ft bgs. The tubing is slotted (torch cut) between 4,467.78 ft to 4,532.31 ft bgs and is open to the lower carbonate aquifer (LCA) groundwater within the well. Figure A-9 provides a well completion diagram of ER-16-1.

The water level was measured in the p1 piezometer by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. A ^{3}H sample was collected on September 23, 2020, from a depth of 4,219 ft bgs from ER-16-1_p1. The ^{3}H result was below the MDC of 142 pCi/L and the result is presented in Table 2-13.

Table 2-13
ER-16-1_p1 ^{3}H Sampling Result

Well	ISPID	Sample Date	^{3}H (pCi/L)
ER-16-1	ER-16-1_p1	09/23/2020	<142

Note:
(1) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.11 U-12n.10 Vent Hole

The U-12n.10 Vent Hole was drilled and completed in June 1975 to a depth of 1,240 ft bgs. The vent hole is completed with 30-in. casing set from the surface to 1,238 ft bgs, which is the top of the N-Tunnel drift. The vent hole cover was reconfigured with a 1-in. plate with a port hole and a short section of casing that allows for air to exhaust to the environment. Two access lines (a1 and a2) have been installed within the 30-in. casing and are open to the LTCU. The a1 access line is landed at 1,200.18 ft bgs, and the a2 access line is landed at 1,193.73 ft bgs. Figure A-10 provides a completion diagram of U-12n.10 Vent Hole.

The water level was measured in the a1 access line by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. Sampling was conducted from October 26 through October 29, 2020, at a depth of 1,184 ft bgs. The ^{3}H, ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and $^{238/239/240}$Pu samples and FD samples were collected from U-12n.10 Vent Hole_o1_a1. The ^{3}H, ^{36}Cl, ^{238}Pu, and $^{239/240}$Pu results were above the MDCs, while the ^{14}C, ^{90}Sr, ^{99}Tc, and ^{129}I results were below the MDCs for the sample and FD sample. The results are presented in Table 2-14.

Table 2-14
U-12n.10 Vent Hole_o1_a1 RN Sampling Results

Well and ISPID	Sample Date	^{3}H	^{14}C	^{36}Cl	^{90}Sr	^{99}Tc	^{129}I	^{238}Pu	$^{239/240}$Pu
		(pCi/L)							
U-12n.10 Vent Hole_o1_a1	10/26/2020 - 10/29/2020	4,410,000 | 4,330,000	<1,360 | <1,360	143 | 128	<6.09 | <7.07	<8.48 | <8.98	<0.926 | <0.644	0.133 | 0.154	1.14 | 1.16

Notes:
(1) The symbol "|" reports the sample and FD results.
(2) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.12 U-12n Vent Hole 2

The U-12n Vent Hole 2 was drilled and completed in 1988 to a depth of 1,263.88 ft bgs. The vent hole is completed with 74-in. casing set from the surface to 1,263.88 ft bgs, which is the top of the N-Tunnel drift. The vent hole has been reconfigured with a 1-in. plate with a port hole and a short section of casing that allows for air to exhaust to the environment. Two access lines (a1 and a2) have been installed within the 74-in. casing and are open to the LTCU. The a1 access line is landed at 1,247.98 ft bgs, and the a2 access line is landed at 1,245.59 ft bgs. Figure A-11 provides a completion diagram of U-12n Vent Hole 2.

The water level was measured in the a1 access line by Navarro before collecting groundwater samples using a depth-discrete bailer. Although the well was not purged, field water-quality parameters were measured and are presented in Table 2-1. Sampling was conducted from November 3 through November 5, 2020, at a depth of 1,227 ft bgs. The ^{3}H, ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and $^{238/239/240}$Pu samples and FD samples were collected from U-12n Vent Hole 2_o1_a1. The ^{3}H and

$^{239/240}$Pu results were above the MDCs, while the ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and ^{238}Pu results were below the MDCs for the sample and the FD. The results are presented in Table 2-15.

Table 2-15
U-12n Vent Hole 2_o1_a1 RN Sampling Results

Well and ISPID	Sample Date	^{3}H	^{14}C	^{36}Cl	^{90}Sr	^{99}Tc	^{129}I	^{238}Pu	$^{239/240}$Pu
		(pCi/L)							
U-12n Vent Hole 2_o1_a1	11/03/2020 - 11/05/2020	666,000 | 676,000	<1,620 | <1,630	<11.7 | <12.6	<5.13 | <5.34	<8.31 | <8.63	<0.584 | <0.677	<0.0395 | <0.0386	1.14 | 1.13

Notes:
(1) The symbol "|" reports the sample and FD results.
(2) The numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

Source: UGTA Chemistry Database (Navarro, 2020b)

2.1.13 FMP Sampling

A Well-Specific Fluid Management Strategy Letter is required by the FMP (NNSA/NSO, 2009) and approved by NDEP. As specified in the Well-Specific Fluid Management Strategy for each well, all fluids generated (purged) during sampling operations with ^{3}H activity less than 400,000 pCi/L are contained in either onsite unlined sumps or discharged to infiltration areas. If the ^{3}H activity is equal to or greater than 400,000 pCi/L, then fluids generated during sampling are contained in onsite lined sumps.

During the RM/SM post-closure water-quality sampling, FMP samples were collected from ER-12-3_m1 and ER-12-4_m1 because the groundwater purged from these wells/completions was discharged to an onsite sump or infiltration area. FMP samples collected for analysis by a commercial laboratory had results below the FMP criteria for metals, gross alpha, gross beta, and ^{3}H as listed in Table A.1-1 in the FMP (NNSA/NSO, 2009). Table 2-16 shows the FMP results for ER-12-3_m1 and ER-12-4_m1.

In accordance with the FMP, ^{3}H monitoring samples were collected daily from the discharge line during sampling activities. The results of onsite ^{3}H monitoring were compared to the FMP ^{3}H discharge criteria; all results were below the discharge criteria

Table 2-16
FMP Sample Results

Well and ISPID	Sample Date	Metals								RNs		
		As	Ba	Cd	Cr	Pb	Hg	Se	Ag	Gross Alpha	Gross Beta	^{3}H
		mg/L								pCi/L		
ER-12-3_m1	07/23/2020	<0.0039 | <0.0039	J 0.028 | J 0.028	<0.00033 | <0.00033	<0.00051 | <0.00051	<0.0013 | <0.0013	<0.000071 | <0.000071	<0.0027 | <0.0027	<0.0011 | <0.0011	<1.7	<2.2	<300
ER-12-4_m1	08/03/2020	<0.0039 | <0.0039	J 0.02 | J 0.02	<0.00033 | <0.00033	<0.00051 | <0.00051	<0.0013 | <0.0013	<0.000071 | <0.000071	<0.0027 | <0.0027	<0.0011 | <0.0011	<1.9	<2.5	<300

Notes:
(1) Values reported with a "|" indicate unfiltered | filtered sample results.
(2) Only filtered samples were collected and reported when a single RN result is shown.
(3) For metals results, the numeric values reported in the table represent the MDL for that analysis; the "<" symbol indicates a sample result less than the MDL.
(4) For RN results, the numeric values reported in the table represent the MDC for that analysis; the "<" symbol indicates a sample result less than the MDC.

MDL = Method detection limit
mg/L = Milligrams per liter

Ag = Silver
As = Arsenic
Ba = Barium
Cd = Cadmium
Cr = Chromium
Hg = Mercury
Pb = Lead
Se = Selenium

Source: UGTA Chemistry Database (Navarro, 2020b)

FMP samples were not collected from Well ER-12-1 or E-Tunnel because the well and ETDS were sampled for permit compliance with the Water Pollution Control (WPC) permit NEV 96021 (Murphy, 2013), and FMP samples are not required for the permit. FMP samples were not collected from WW-8 because the water discharged from this well is contained in an onsite storage tank. FMP samples were also not collected from the remaining wells because these wells were sampled with a depth-discrete bailer, and no water was discharged to a sump or infiltration area.

2.2 Water-Level Monitoring

The objective of long-term monitoring is to provide groundwater chemistry and water-level data to evaluate consistency with (1) the groundwater flow and contaminant transport conceptual and numerical model, and (2) the UR boundaries and regulatory boundaries to ensure the closure strategy remains protective of human health and the environment.

There are seven wells and two vent holes, with a total of nine completions, in the post-closure water-level monitoring network that are measured annually (Figure 2-2). In CY 2020, water levels were measured in these wells in the RM/SM CAU by Navarro and USGS personnel (Table 2-17). Figures 2-4 through 2-7 present long-term water-level trends for nine completions within the RM/SM post-closure water-level monitoring network. Appendix A presents the well completion diagrams for the wells in the post-closure water-level monitoring network. Appendix B presents the hydrographs for the nine monitoring locations from the USGS/DOE Cooperative Studies in Nevada web page (USGS/DOE, 2021).

Table 2-17
CY 2020 Water-Level Measurements
(Page 1 of 2)

Monitoring Location	Date	Depth to Water (ft bgs)	HSU
ER-12-3_m1 [a]	07/21/2020	3,112.57	LCA3
ER-12-4_m1 [a]	07/28/2020	2,566.98	LCA3
U-12s_o1 [b]	08/12/2020	908.9	MGCU
ER-12-4_p1 [b]	08/20/2020	951.4	LVTA1/BRCU/LTCU/OSBCU
ER-12-3_p1 [a]	08/24/2020	1,242.53	LTCU/OSBCU/ATCU
TW-1_m1 [a]	09/03/2020	1,459.80	OSBCU/RVA/LTCU1/ATCU

Table 2-17
CY 2020 Water-Level Measurements
(Page 2 of 2)

Monitoring Location	Date	Depth to Water (ft bgs)	HSU
ER-16-1_p1 [a]	09/22/2020	4,167.13	LCA
U-12n.10 Vent Hole_o1_a1 [a, c]	10/26/2020	1,171.44	LTCU
U-12n Vent Hole 2_o1_a1 [a, c]	11/03/2020	1,212.77	LTCU

[a] Water level was measured by Navarro before groundwater sampling activities.
[b] Water level was measured by USGS and obtained from the USGS National Water Information System website (USGS, 2021).
[c] The water levels in the vent holes could not be measured until after the M&O contractor reconfigured the vent hole covers.

HSU = Hydrostratigraphic unit
LTCU1 = Lower tuff confining unit 1
MGCU = Mesozoic granite confining unit

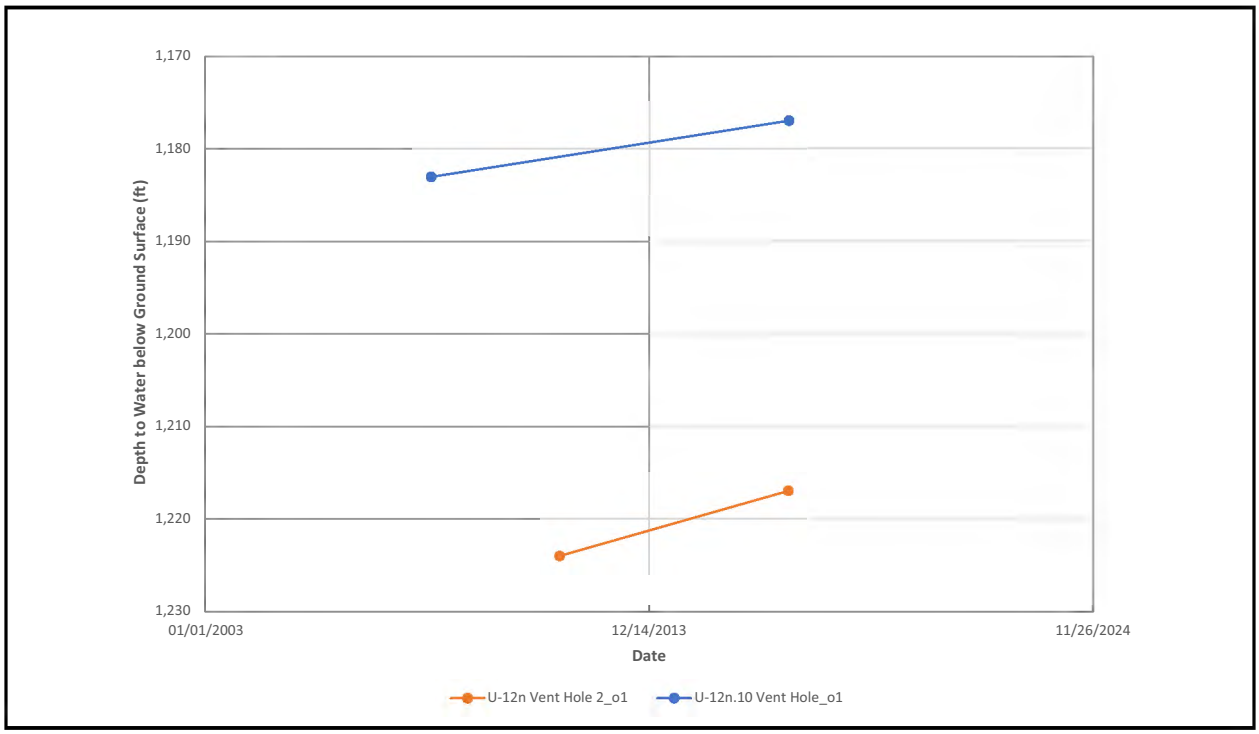

Figure 2-4
Long-Term Water-Level Trends in RM Vent Holes

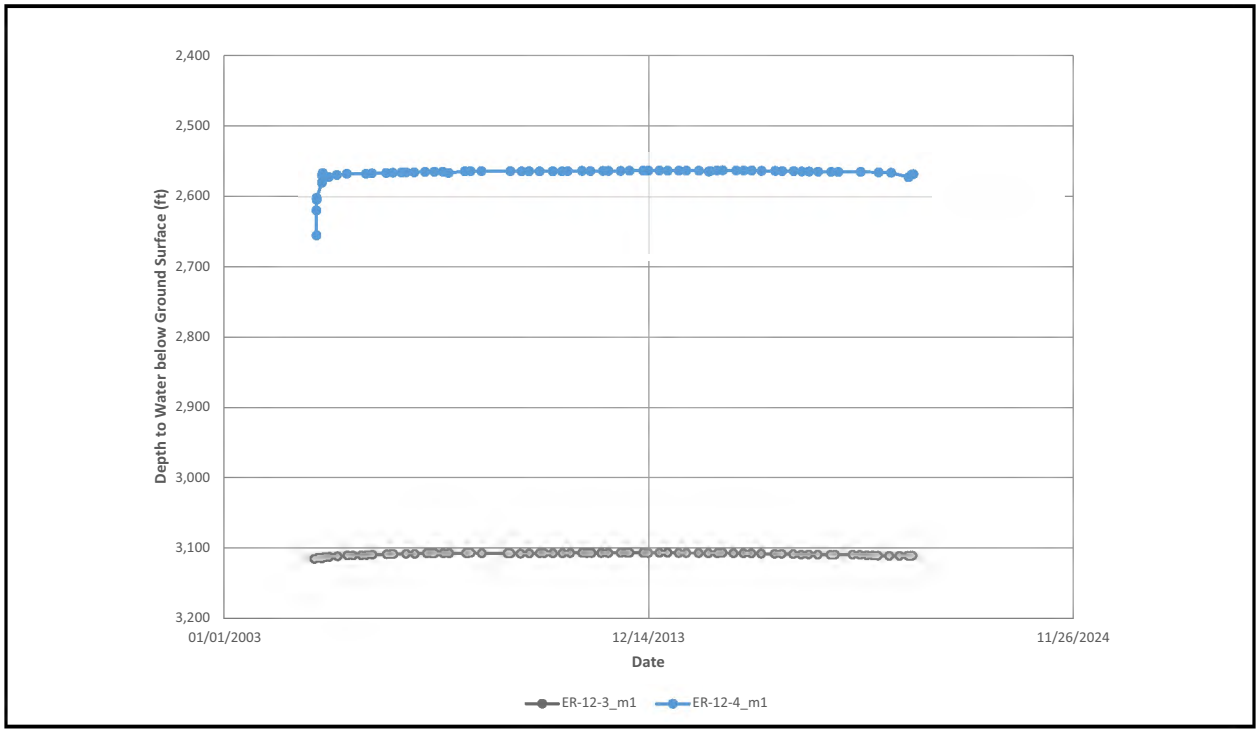

Figure 2-5
Long-Term Water-Level Trends in RM Carbonate Wells

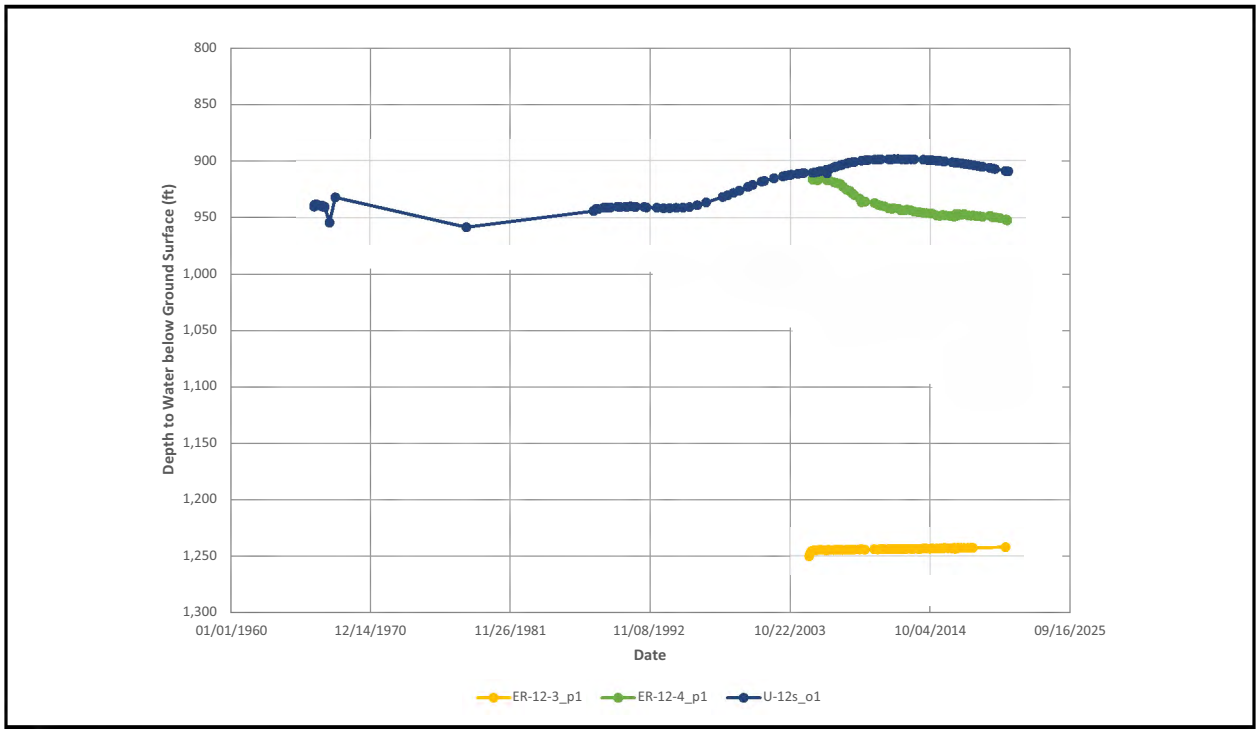

Figure 2-6
Long-Term Water-Level Trends in RM Low-Permeability Wells

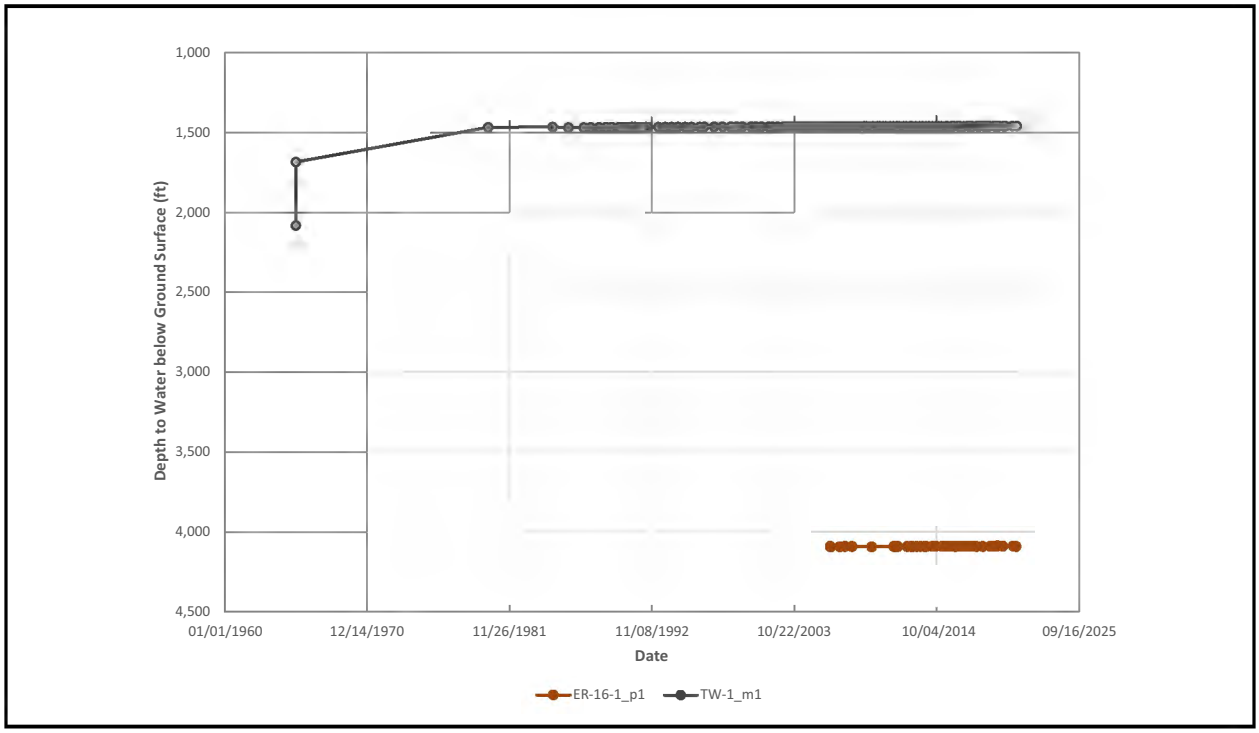

Figure 2-7
Long-Term Water-Level Trends in SM Well and Distal Volcanic Well

3.0 Well Site Surveillance

There are 16 sampling and water-level measurement wells/locations in the RM/SM post-closure monitoring network that are maintained to correct deficiencies such as erosion around wellheads and to ensure well security (Figures 2-1 and 2-2, and Table 3-1). Water sampling wells, sumps, discharge areas, and areas surrounding the wells will be inspected for damage before groundwater sampling begins and inspected again after sampling is completed. Any condition that affects the serviceability of a well will be noted on the Well Site Surveillance form and reported for corrective action. Items that are considered cosmetic or housekeeping, and that do not affect the serviceability of the well, are noted on the surveillance form and will be used for the well site cleanup activities.

At all wells, the well site surveillance verifies the following:

- The wells and piezometers are locked.
- The wells and piezometers are properly marked with ISPID tags.
- The survey point is marked and undamaged.
- The well pad is clear and in good condition.
- The pad around the well is not damaged or eroded (e.g., no potential for standing water).
- Any damage to the well, piezometers, or pad is noted.

The same inspection items discussed above are checked before sampling the wells used for water-quality monitoring and inspected again after sampling is completed. Additionally, the conditions of the wells, sumps, discharge areas, and areas surrounding the wells are inspected for damage before sampling and are assessed for the following:

- Is the infiltration area still viable?
- Have any new roads or facilities been constructed?
- Have there been any changes to the drainage pattern or area?

In addition to the inspection items listed above, photos will be taken during the inspections to document the conditions of the well site.

The water-quality monitoring wells and the water-level monitoring network wells were inspected before and after sampling activities were completed, and sampling equipment was moved off the well pad (Table 3-1). The general road conditions, well pad conditions, infiltration areas, and surrounding areas were evaluated. Moderate to heavy vegetation is present on three of the well pads (ER-12-3,

TW-1, and UE-18t), but the majority of the well pads are in good condition with no damage around the wellheads.

Corrective actions at the well sites will include the following:

- Vegetation on the well pads will be removed during well site cleanup activities and before future sampling activities.

Table 3-1
Well Site Surveillance Results in CY 2020 for Yucca Flat Water-Quality and Water-Level Monitoring Wells
(Page 1 of 2)

Well and ISPID	Well and Piezometers Locked?	Wells and Piezometers Properly Marked with ISPID Tags?	Well Pad Clear and in Good Condition?	Any Damage to Well, Piezometer, or Well Pad?	Survey Point Clearly Marked and Undamaged?	Pad around Well Is Undamaged?	Infiltration Area Viable?	Any New Roads or Facilities Constructed ?	Any Changes to Drainage Pattern or Area?	Photos Taken?
ER-12-1_m5 [a]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
ER-12-3_m1 [b] ER-12-3_p1 [b]	Yes	Yes	Yes [d]	No	Yes	Yes	Yes	No	No	Yes
ER-12-4_m1 [b] ER-12-4_p1 [c]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
ER-16-1-p1 [b]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
ER-19-1_p1 [a] ER-19-1_p2 [a]	Yes [e]	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
ER-30-1_m2 [a]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
E-Tunnel_mine1 [a]	Yes	Yes	Yes	No	N/A [f]	Yes	Yes [g]	No	No	Yes
TW-1_m1 [b]	Yes	Yes	Yes [d]	No	Yes	Yes	Yes	No	No	Yes
U-12n Vent Hole 2_o1_a1 [b]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
U-12n.10 Vent Hole _o1_a1 [b]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
U-12s_o1 [c]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes

Table 3-1
Well Site Surveillance Results in CY 2020 for Yucca Flat Water-Quality and Water-Level Monitoring Wells
(Page 2 of 2)

Well and ISPID	Well and Piezometers Locked?	Wells and Piezometers Properly Marked with ISPID Tags?	Well Pad Clear and in Good Condition?	Any Damage to Well, Piezometer, or Well Pad?	Survey Point Clearly Marked and Undamaged?	Pad around Well Is Undamaged?	Infiltration Area Viable?	Any New Roads or Facilities Constructed ?	Any Changes to Drainage Pattern or Area?	Photos Taken?
UE-18t_o1 [a]	Yes	Yes	Yes [d]	No	Yes	Yes	Yes	No	No	Yes
WW-8_m26 [a]	Yes	Yes	Yes	No	Yes	Yes	N/A [h]	No	No	Yes

[a] Completion is a water-quality monitoring point.
[b] Completion is both a water-quality monitoring point and a water-level monitoring point.
[c] Completion is a water-level monitoring point.
[d] Well pad is in good condition, but heavy to moderate vegetation is present on pad.
[e] The p1 piezometer is locked, but the p2 piezometer cannot be locked; the p2 piezometer is flush with the landing plate and is covered with a steel plate.
[f] Not applicable; the ETDS box has no survey point. A survey point is not needed because a water level is not measured at E-Tunnel.
[g] Infiltration area is the E-Tunnel ponds, which are inspected monthly by the M&O contractor for the WPC permit.
[h] Well is a water production well; no infiltration area present.

4.0 Institutional Controls

Institutional controls are an important and inherent part of the corrective action chosen for CAU 99. The institutional controls in place to limit access to areas of potentially contaminated groundwater at CAU 99 include government ownership, access control, federal oversight, and a State of Nevada water-use application process. These controls are monitored annually to verify performance.

The institutional controls established through the CR (DOE/EMNV, 2020) are restrictions that apply within the RM and SM UR areas. The UR boundary for RM follows the regulatory boundary except in the southwest direction, where the UR generally corresponds with Rainier Mesa Road and Pahute Mesa Road. The UR for SM coincides with the regulatory boundary. The final UR boundaries were negotiated between EM Nevada Program and NDEP. The UR coordinates have been verified with the M&O contractor and have been posted in the M&O Geographic Information System. The URs have not been entered into the FFACO database yet; the recording process is planned to be completed in the near future (Dinsman, 2021). When the UR recording process is complete, NDEP will be notified.

The URs must be verified annually per the CR. The UR is documented in the RM/SM CR (see Appendix C). The URs continue to prevent exposure of the public, workers, and the environment to contaminants of concern by preventing use of potentially contaminated groundwater.

4.1 Water Usage on NNSS RM/SM and Surrounding Basins

On the NNSS, there are no active production/water supply wells in the RM/SM CAU (Ortego, 2021c) (see Appendix C). The closest active production/water supply well to the RM/SM CAU is WW-8, which produced 8,555,172 gal in CY 2020 (Ortego, 2021a).

Real Estate/Operations Permit (REOP) Risk and Hazard Questionnaire question 9H, “Activities that will require an increase in use of groundwater resources, either through requiring additional volume from an existing well, or installation of a new water well,” did not have any positive answers. REOP Risk and Hazard Questionnaire question 9I, “Activities that include drilling, excavating, or impacting the subsurface at a depth of 50 feet or greater below the surface. This includes any underground/tunnel activities,” did have a positive answer for work planned for CY 2021 for

instrument/core holes in P-Tunnel. These instrument/core holes are being drilled well above the water table without any impact to the RM hydrographic environment. There may be similar additional instrument/core hole drilling from P-Tunnel later during CY 2021, but no impact is expected. (Ortego, 2021b) (see Appendix C).

A query was sent in February 2021 to the Nevada Division of Water Resources (NDWR) specialists responsible for the basins of interest to inquire whether they are aware of any upcoming large-scale projects or other changes that could involve significant increases or decreases in groundwater pumping in the region, but that have not yet reached the application phase (Sullivan, 2021). The answer was negative for the reporting period (see Appendix C).

A search on the NDWR website for hydrographic basin summaries by manner of use was conducted for Emigrant Valley-Groom Lake Valley, Emigrant Valley-Papoose Lake Valley, Frenchman Flat, Fortymile Canyon-Buckboard Mesa, Kawich Valley Basin, Yucca Flat, Oasis Valley, and Crater Flat (NDWR, 2021). This search of groundwater resources in these basins surrounding RM/SM identified industrial, mining, recreation, and municipal use of the groundwater (see Appendix C).

5.0 Triggers Reported

The corrective action for the RM/SM CAU is closure in place with long-term monitoring and institutional controls; and involves a balance of modeling, monitoring, and institutional controls (FFACO, 1996 as amended). Triggers have been established to assess whether this corrective action is adequate for protecting public health and safety.

The RM/SM CAU monitoring network has a trigger of 1,000-pCi/L measurement of ^{3}H. This trigger is 5 percent of the U.S. Environmental Protection Agency's (EPA) *Safe Drinking Water Act* (SDWA) (CFR, 2020) maximum contaminant level (MCL) of 20,000 pCi/L. The wells within the network are sampled only for ^{3}H until the trigger is reached or exceeded. If the 1,000-pCi/L ^{3}H trigger is reached or exceeded, ^{129}I and ^{14}C will be added to the sampling requirements for the location that exceeded the trigger point for all subsequent samplings.

There are three sampling locations that exceeded the ^{3}H trigger of 1,000 pCi/L: U-12n.10 Vent Hole_o1_a1, U-12n Vent Hole 2_o1_a1, and E-Tunnel_mine1. These locations will be sampled every six years and will have the expanded analyte suite of ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and $^{238/239/240}Pu$. No other wells sampled in the RM/SM CAU during CY 2020 had ^{3}H concentrations that exceeded the trigger level of 1,000 pCi/L.

In addition to the RM/SM CAU monitoring network trigger, there are three additional triggers listed in the CR (DOE/EMNV, 2020) that have not been reached in CY 2020:

- No issues have been identified during well inspections that require immediate corrective actions.
- No activity has been identified within the UR boundary that would require an increase in use of groundwater resources, either through requiring additional volume from an existing well or installation of a new water well.
- No activity has been identified within the UR boundary that includes drilling, excavating, or impacting the subsurface at or below the water table.

6.0 Conclusions

The regulatory closure of CAU 99 requires groundwater monitoring at 14 locations every six years. At 11 locations, ^{3}H is monitored; while at 3 locations, an expanded suite of RNs is monitored. This report presents the results of monitoring conducted for water quality, water levels, and institutional controls in CY 2020.

With the exception of three locations (E-Tunnel, U-12n.10 Vent Hole, and U-12n Vent Hole 2), no ^{3}H was detected in the monitoring samples. These three locations will be sampled every six years and will have the expanded analyte suite of ^{14}C, ^{36}Cl, ^{90}Sr, ^{99}Tc, ^{129}I, and $^{238/239/240}Pu$. Water-level measurements in CY 2020 were generally consistent with previous measurements in the monitoring wells.

The URs were verified as being in place to limit access to the area within the UR boundaries. The U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office (NNSA/NFO) and EM Nevada Program report no activities during CY 2020 or activities on the planning horizon that would significantly impact withdrawal of groundwater within the RM/SM CAU. Regionally, water-rights records indicate no large increases in groundwater use in basins adjoining RM/SM CAU, and NDWR personnel report no knowledge of pending activities that have yet to reach the formal application stage.

7.0 References

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Ortego, P.K., Mission Support and Test Services, LLC. 2021b. Email to C. Birney (Navarro) titled "REOP risk hazard questions 9h and 9i regarding Rainier Mesa/Shoshone Mountain," 1 March. Las Vegas, NV.

Ortego, P.K., Mission Support and Test Services, LLC. 2021c. Email to C. Birney (Navarro) titled "Water Supply/Production Wells in RM/SM CAU," 1 March. Las Vegas, NV.

Sullivan, A., Nevada Division of Water Resources. 2021. Email to C. Birney (Navarro) titled "RE: Request for info - Rainier Mesa/Shoshone Mountain," 9 February. Carson City, NV.

USGS, see U.S. Geological Survey.

USGS/DOE, see U.S. Geological Survey and U.S. Department of Energy.

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Appendix A

Well Completion Diagrams

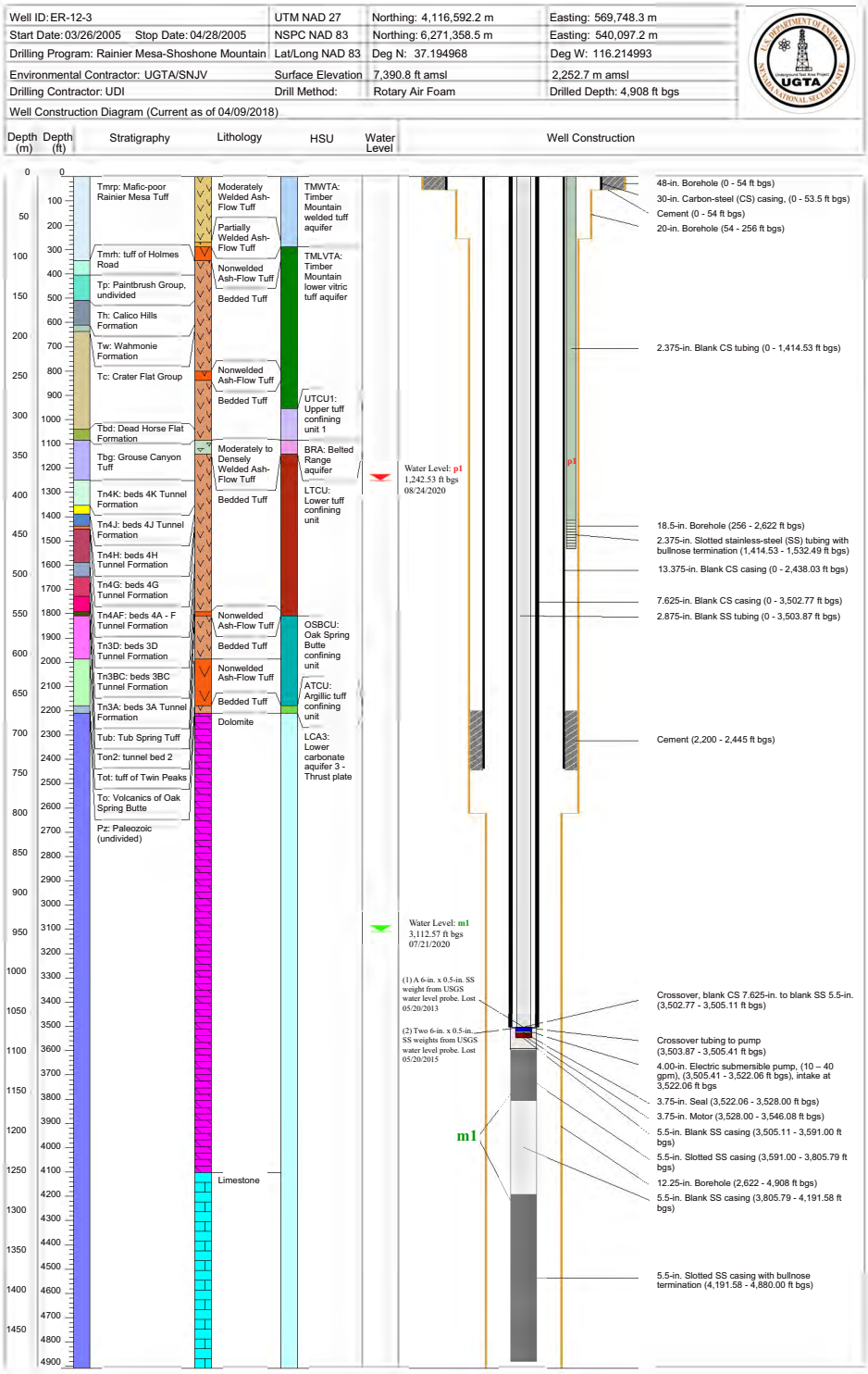

Figure A-1
Well Completion Diagram for ER-12-3

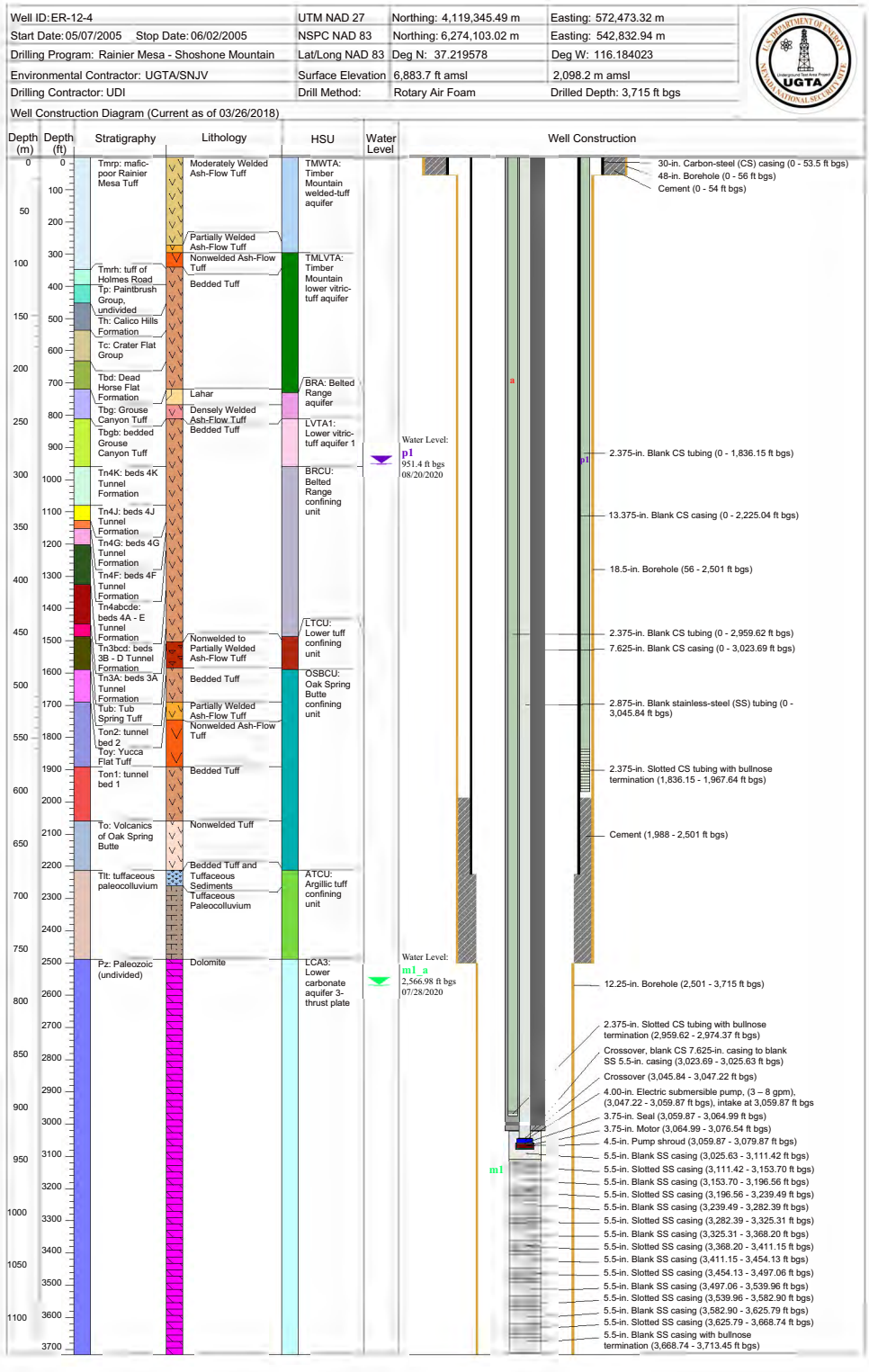

Figure A-2
Well Completion Diagram for ER-12-4

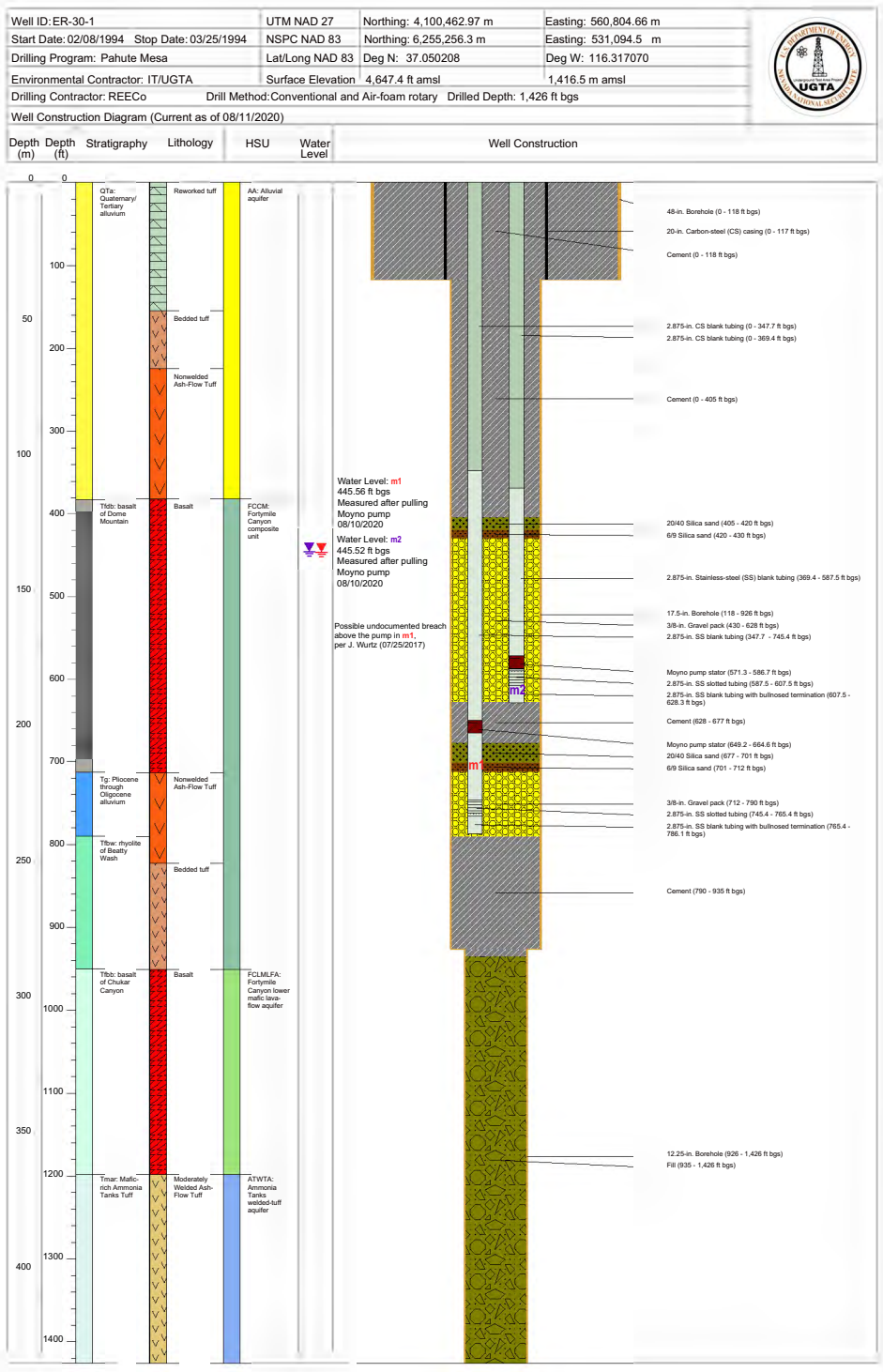

Figure A-3
Well Completion Diagram for ER-30-1

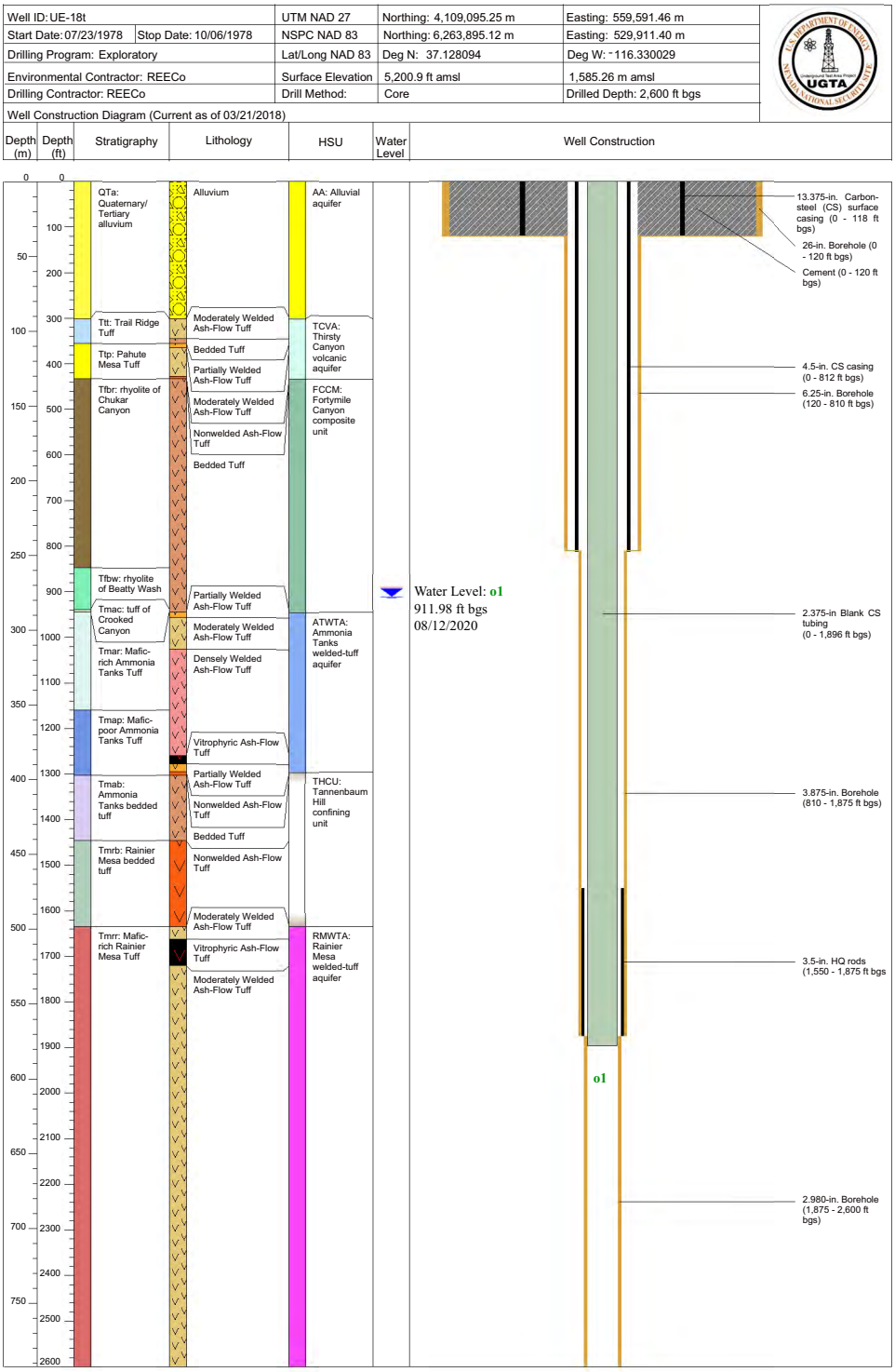

Figure A-4
Well Completion Diagram for UE-18t

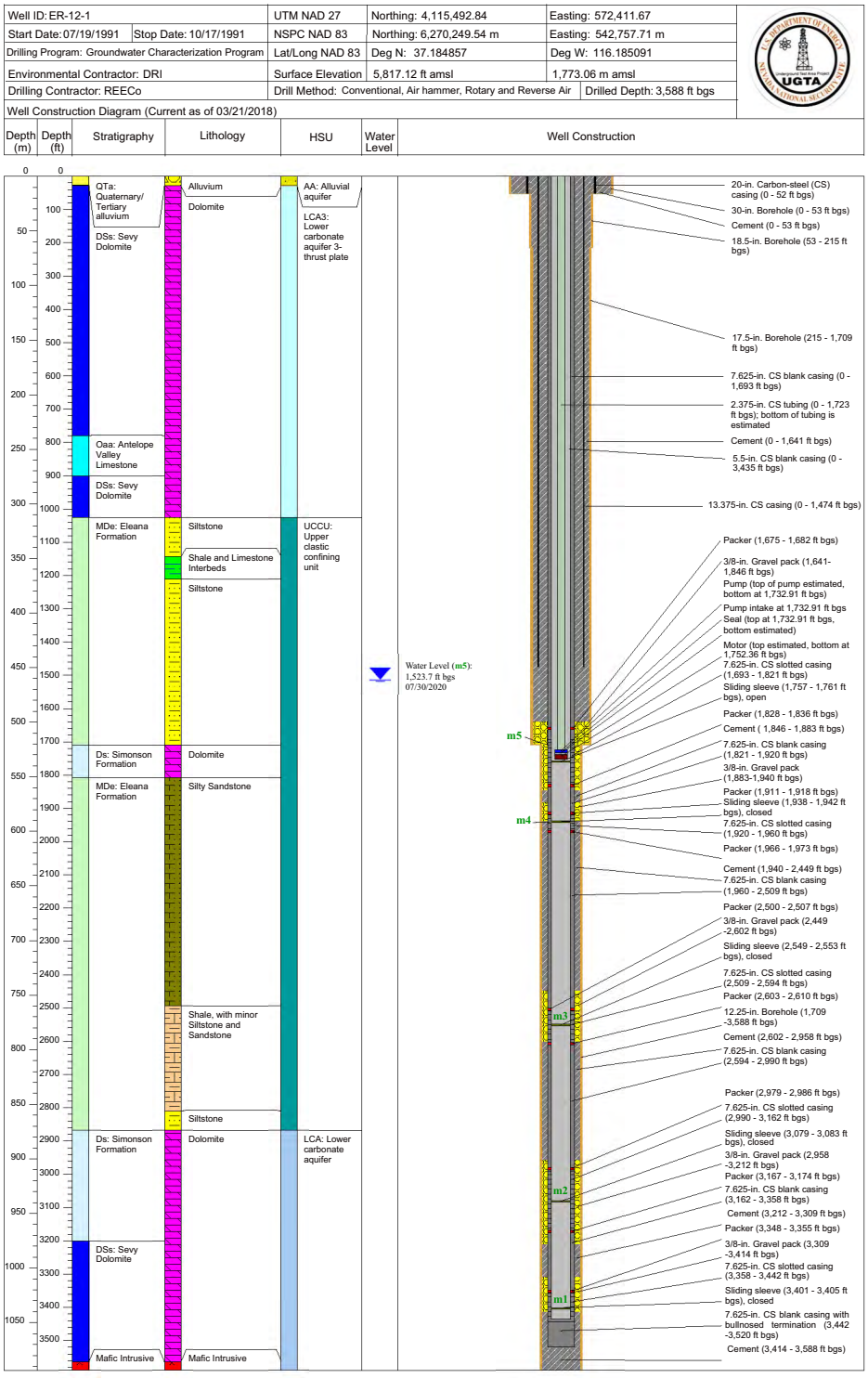

Figure A-5
Well Completion Diagram for ER-12-1

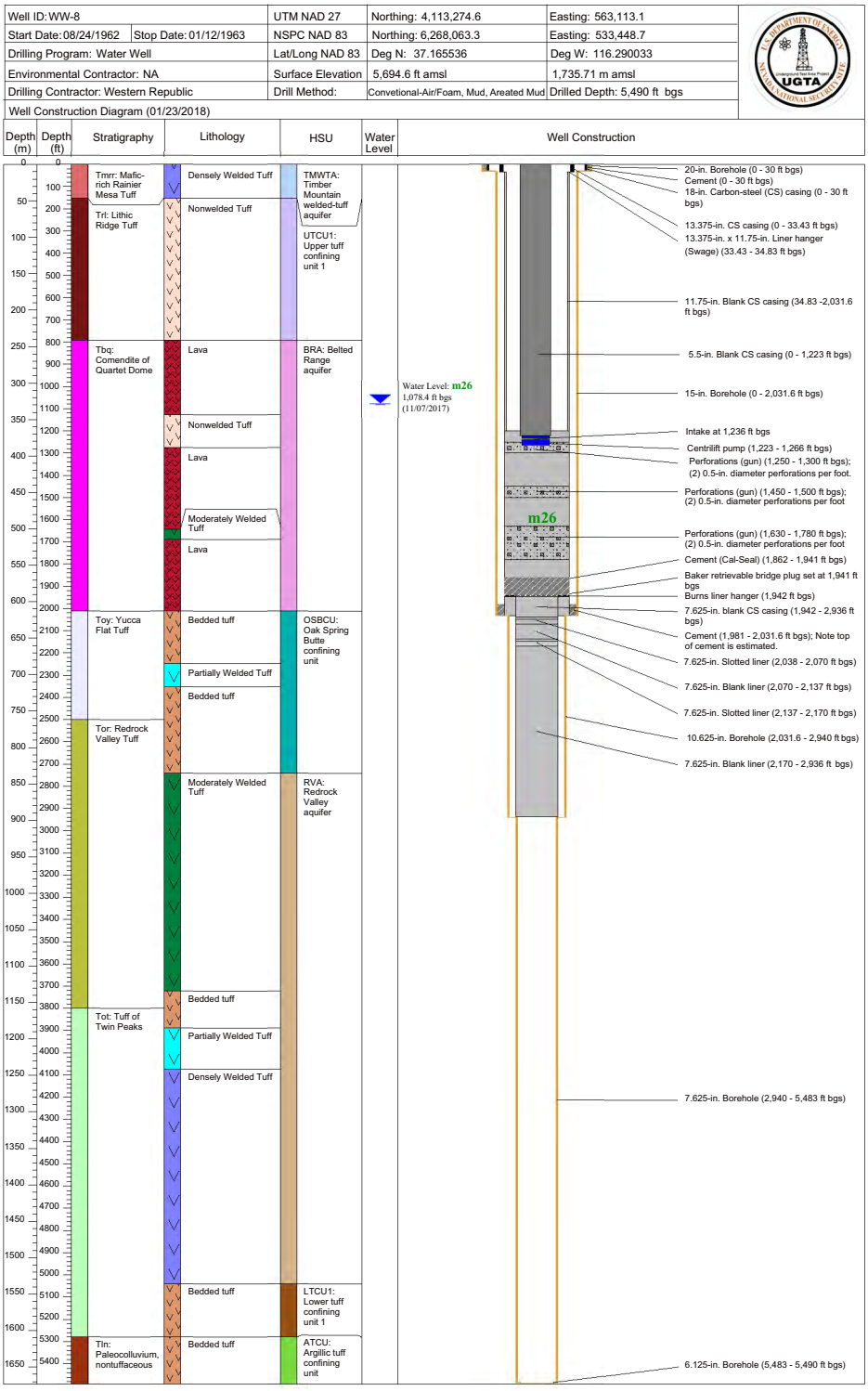

Figure A-6
Well Completion Diagram for WW-8

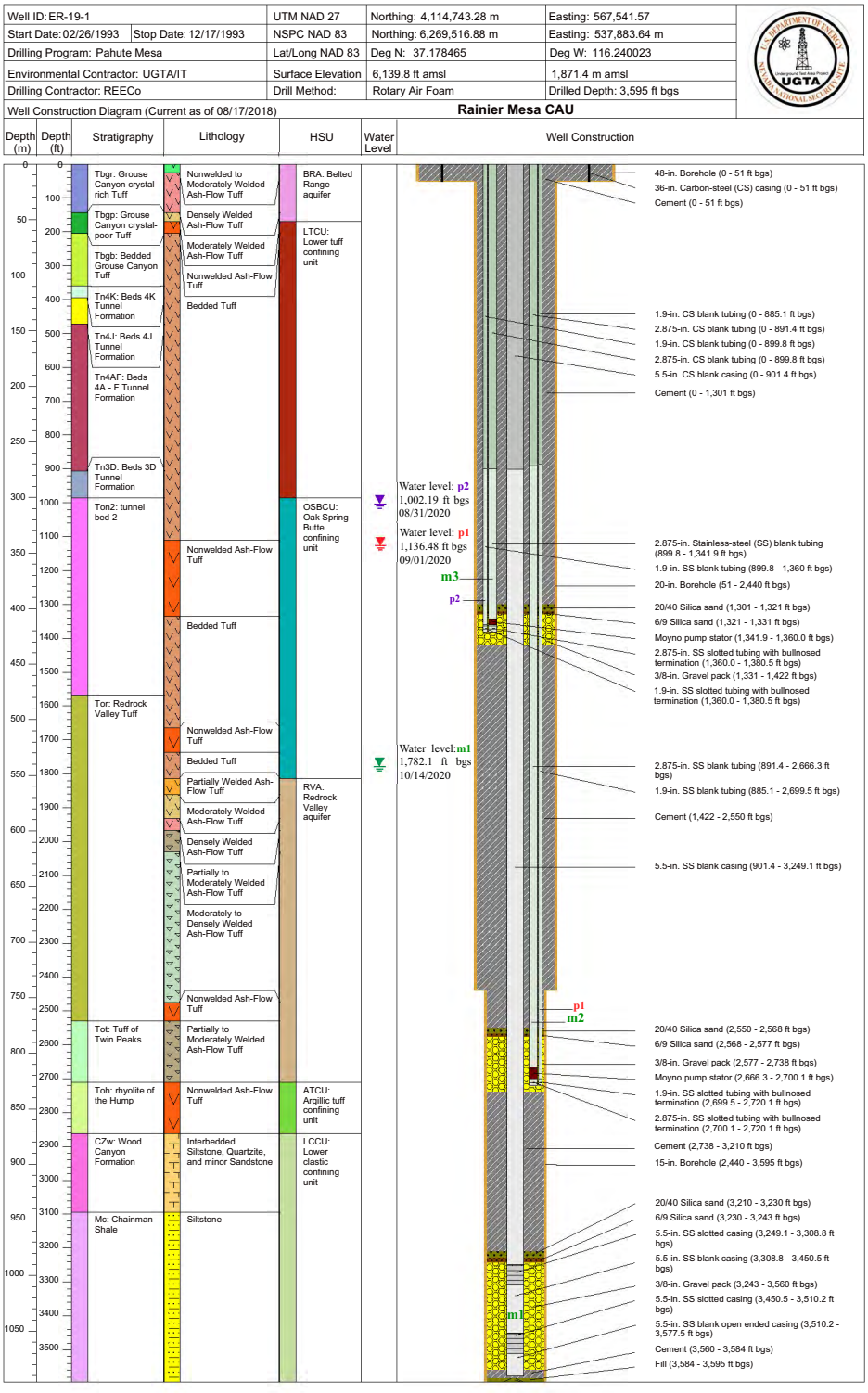

Figure A-7
Well Completion Diagram for ER-19-1

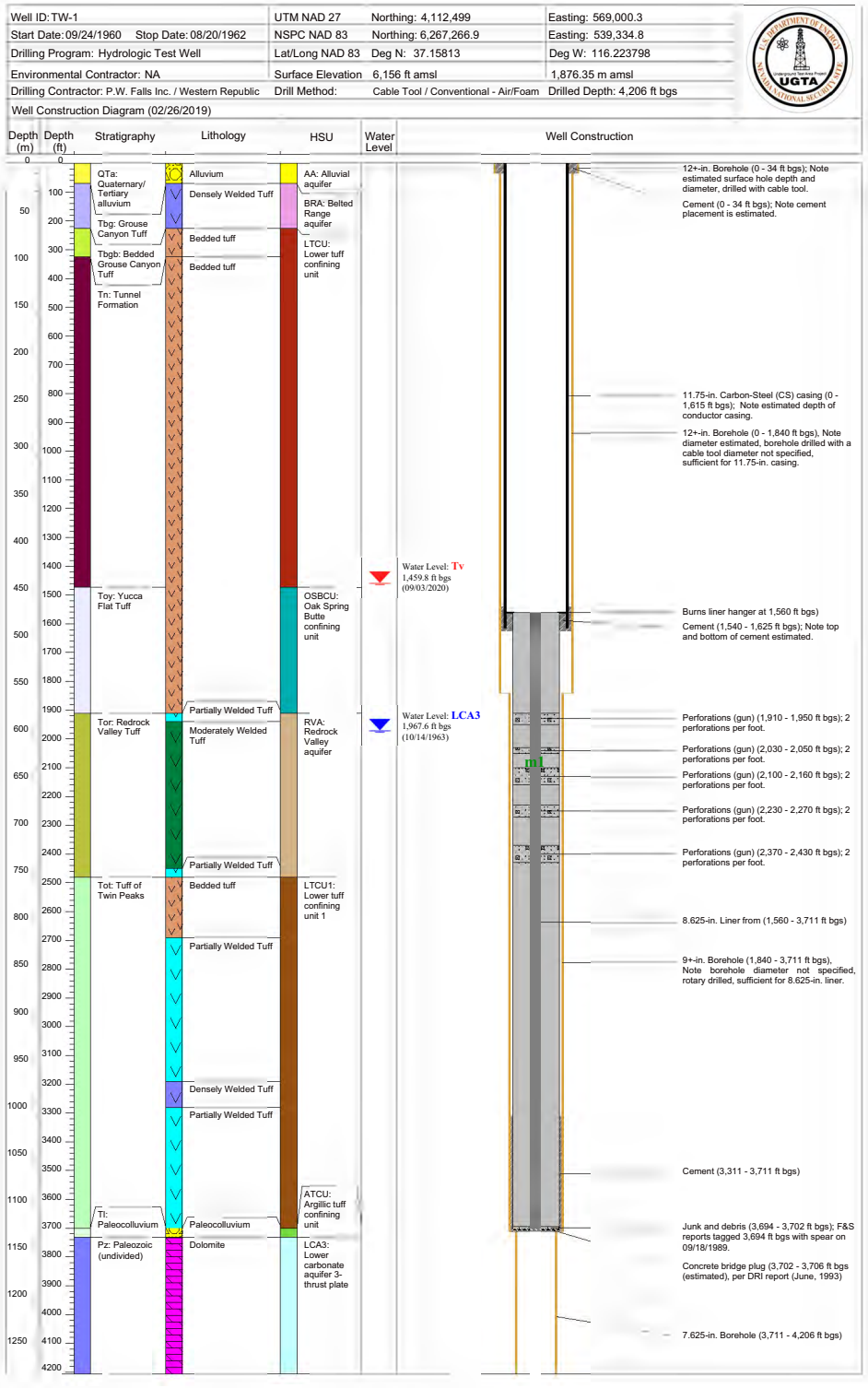

Figure A-8
Well Completion Diagram for TW-1

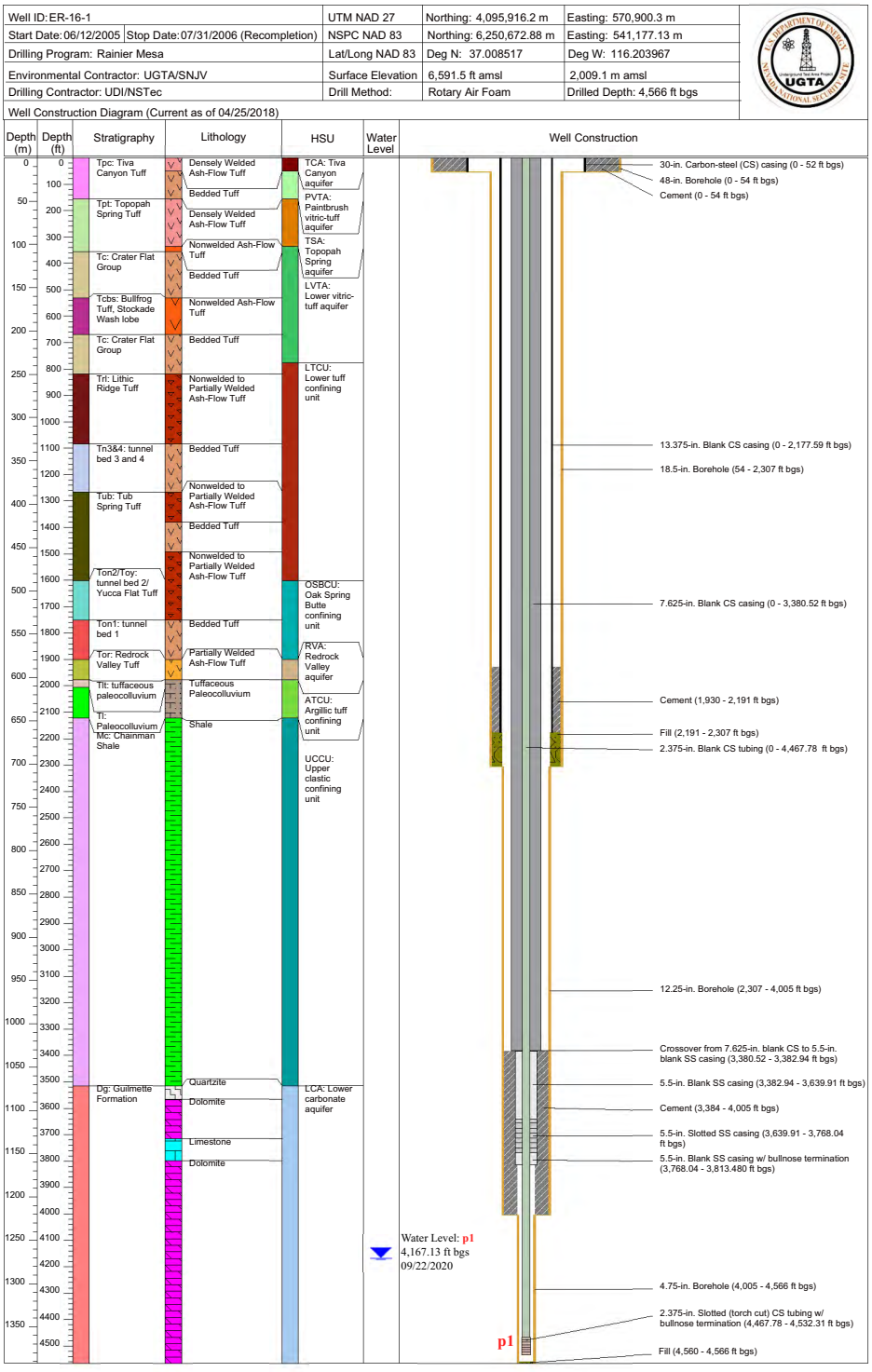

Figure A-9
Well Completion Diagram for ER-16-1

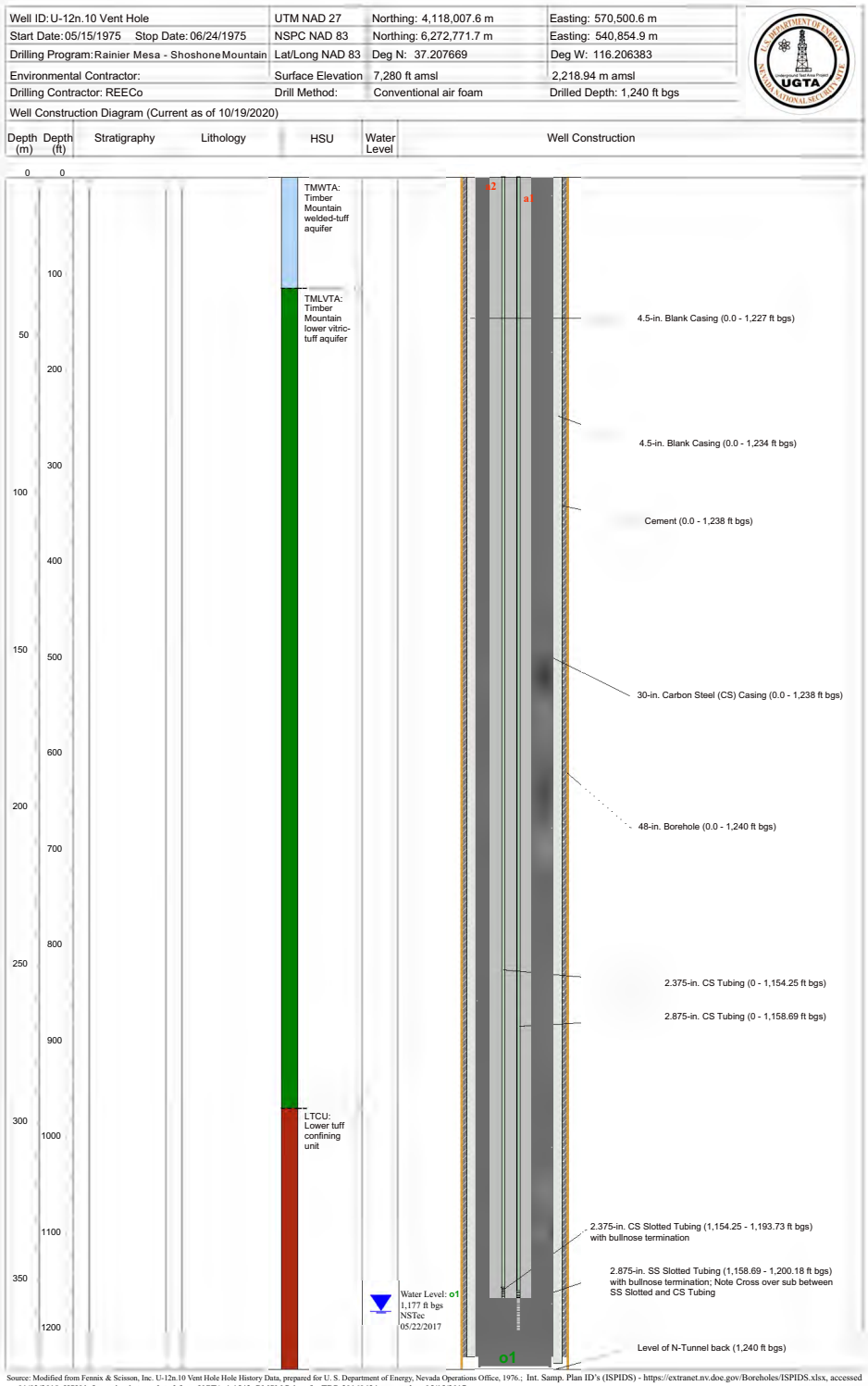

Figure A-10
Well Completion Diagram for U-12n.10 Vent Hole

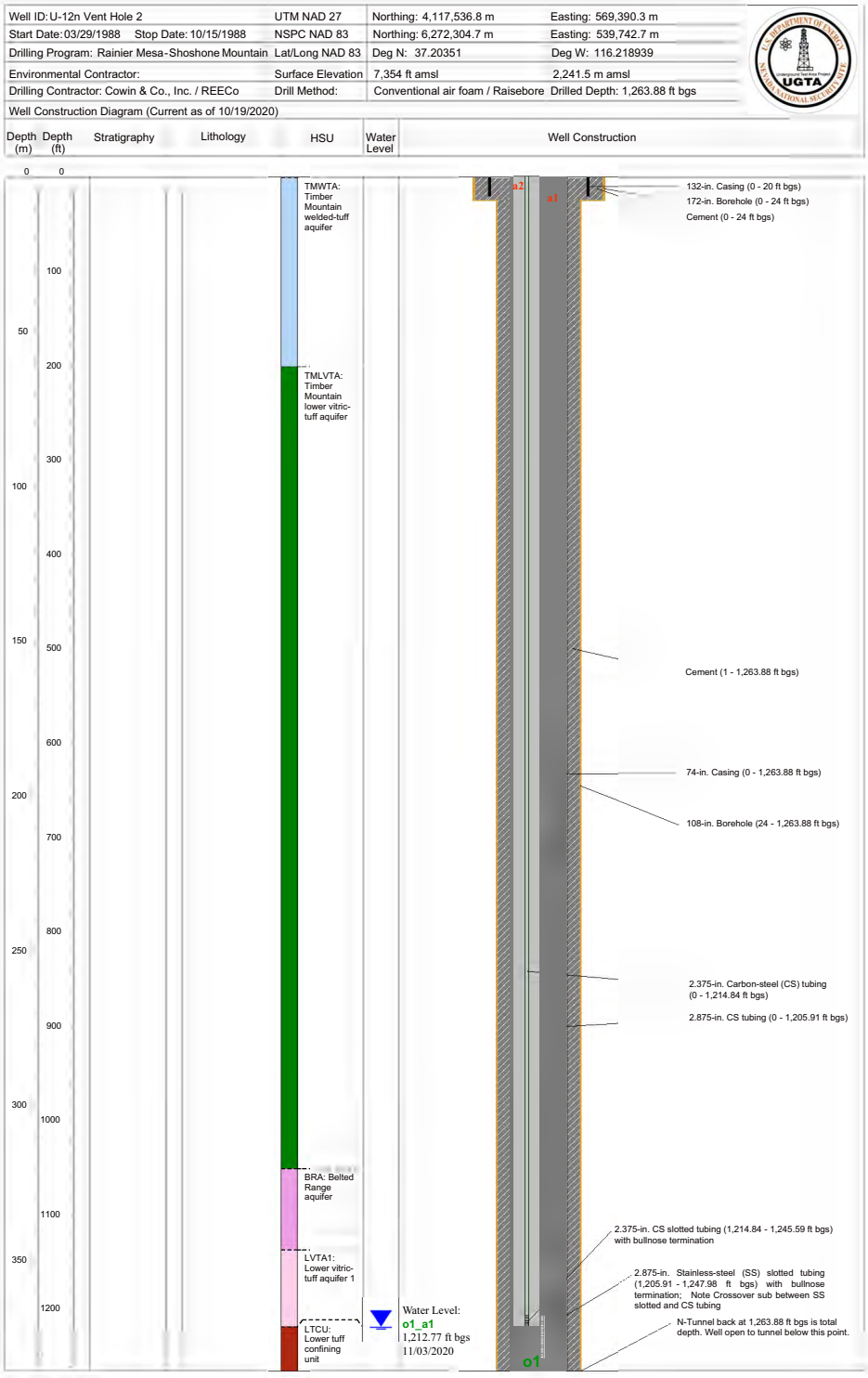

Figure A-11
Well Completion Diagram for U-12n Vent Hole 2

Appendix B

Hydrographs

B.1.0 Hydrographs

The following figures (Figures B-1 through B-9) show hydrographs from the water-level monitoring network for RM/SM CAU (USGS/DOE, 2021).

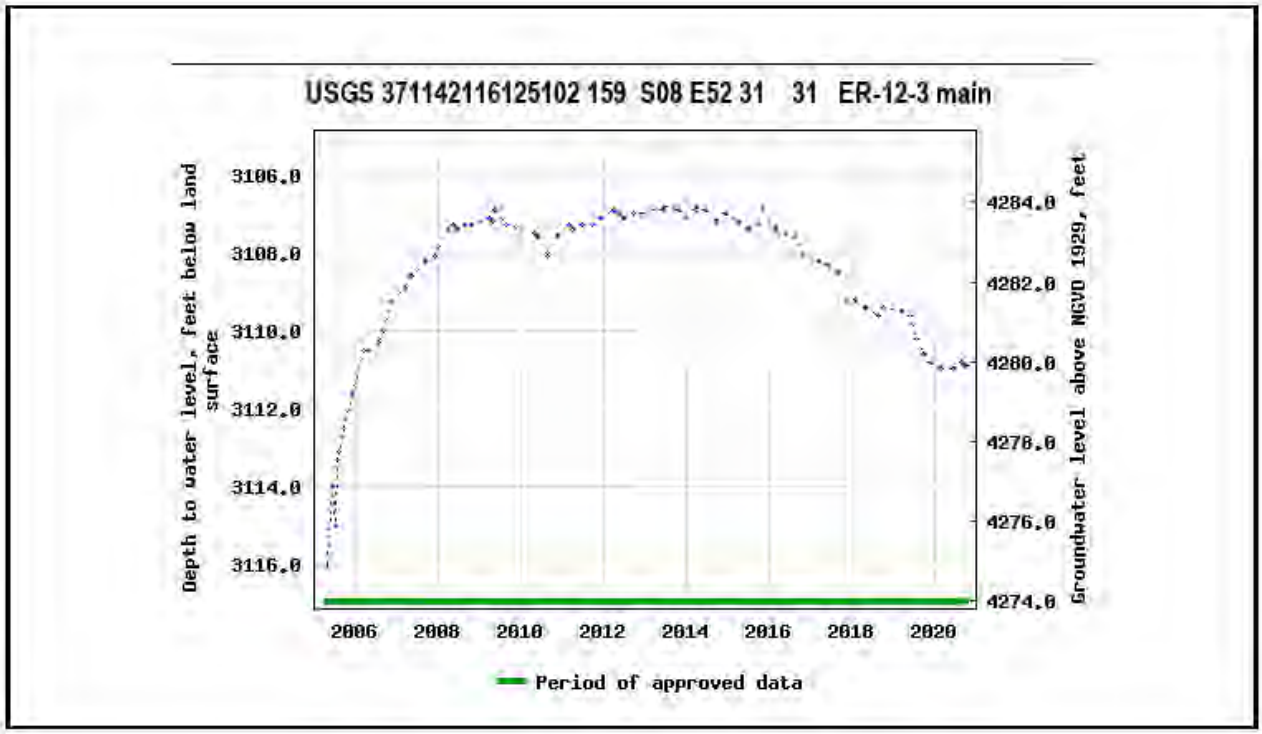

Figure B-1
Water Levels in ER-12-3_m1

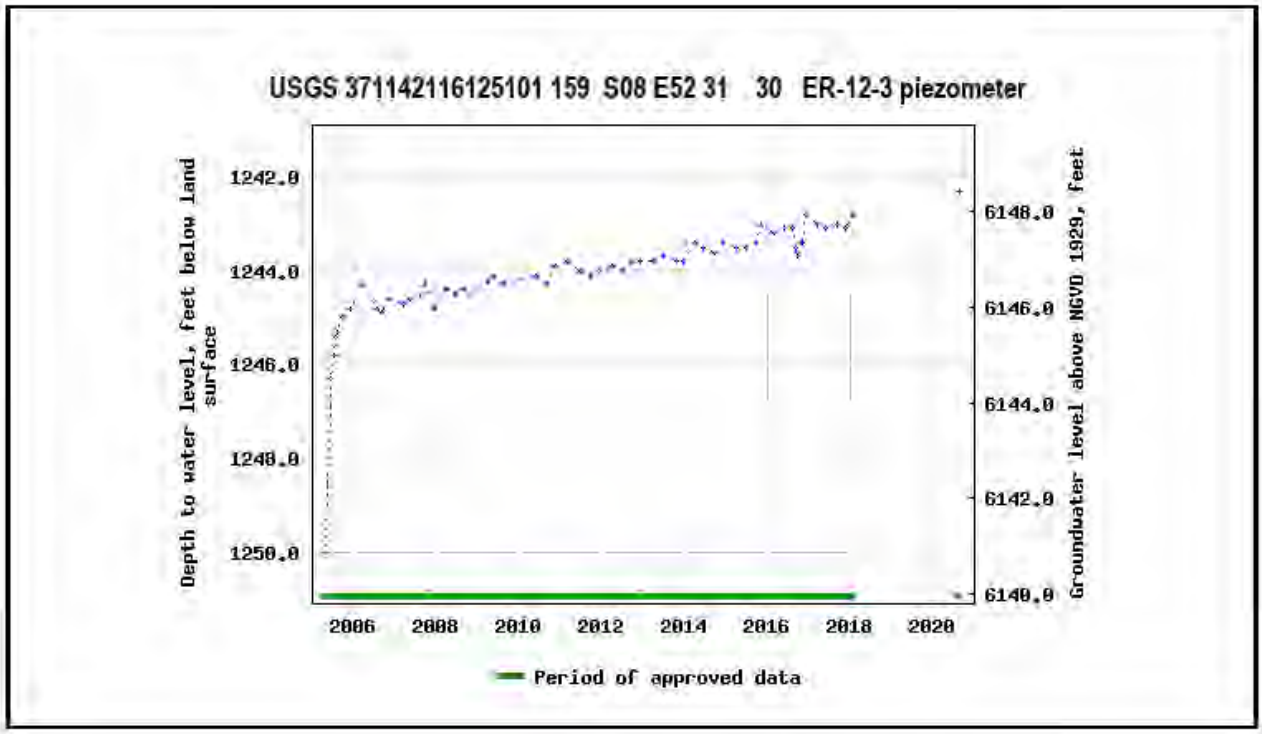

Figure B-2
Water Levels in ER-12-3_p1

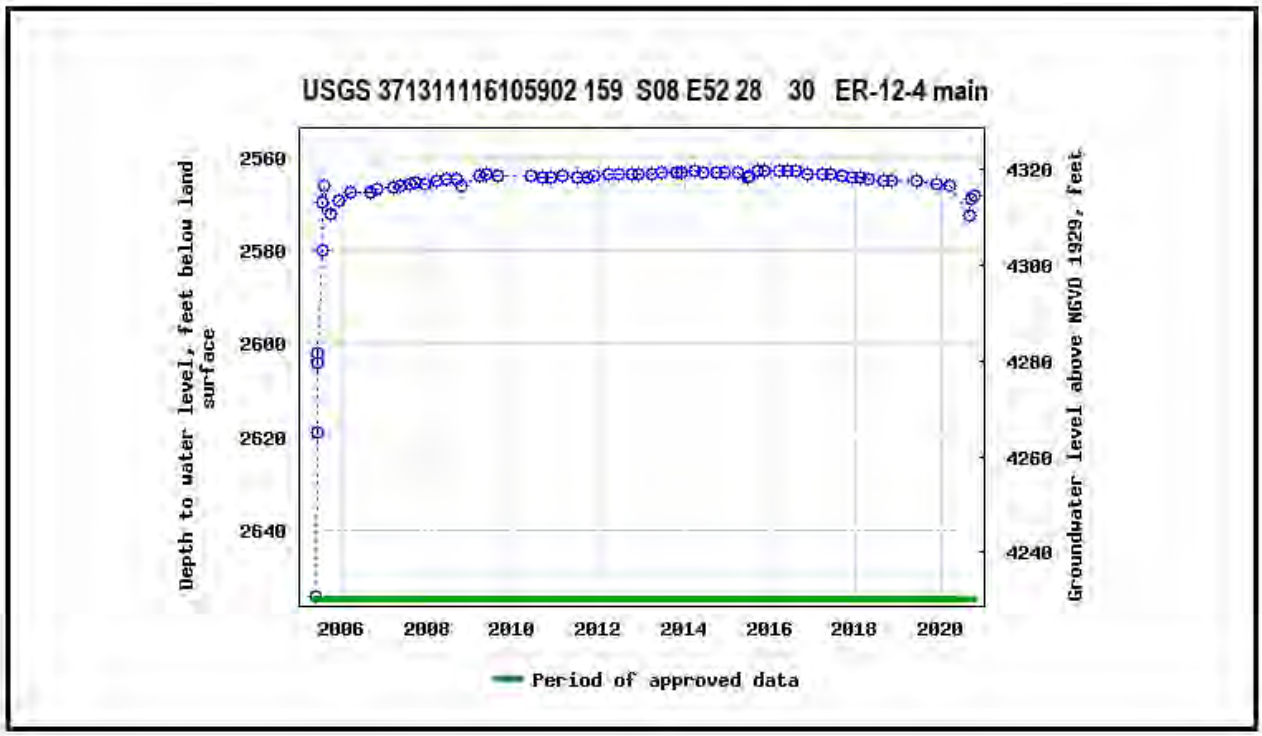

Figure B-3
Water Levels in ER-12-4_m1

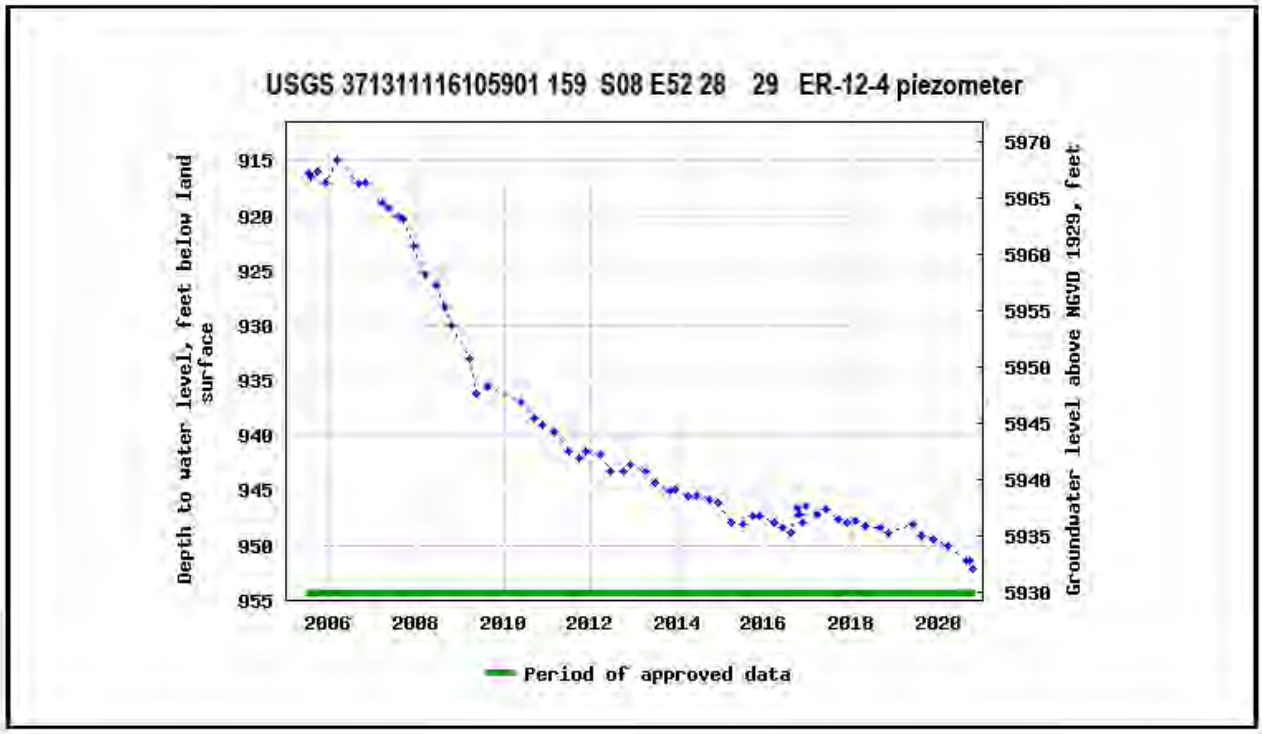

Figure B-4
Water Levels in ER-12-4_p1

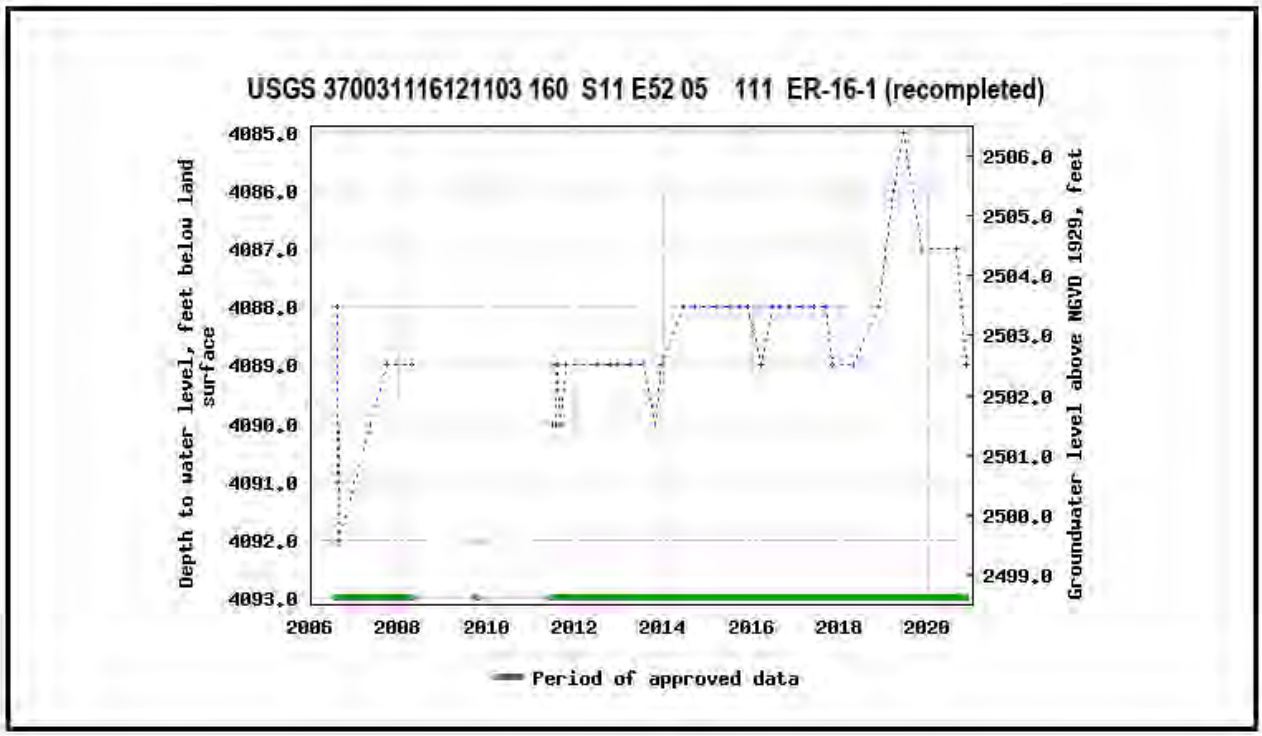

Figure B-5
Water Levels in ER-16-1_p1

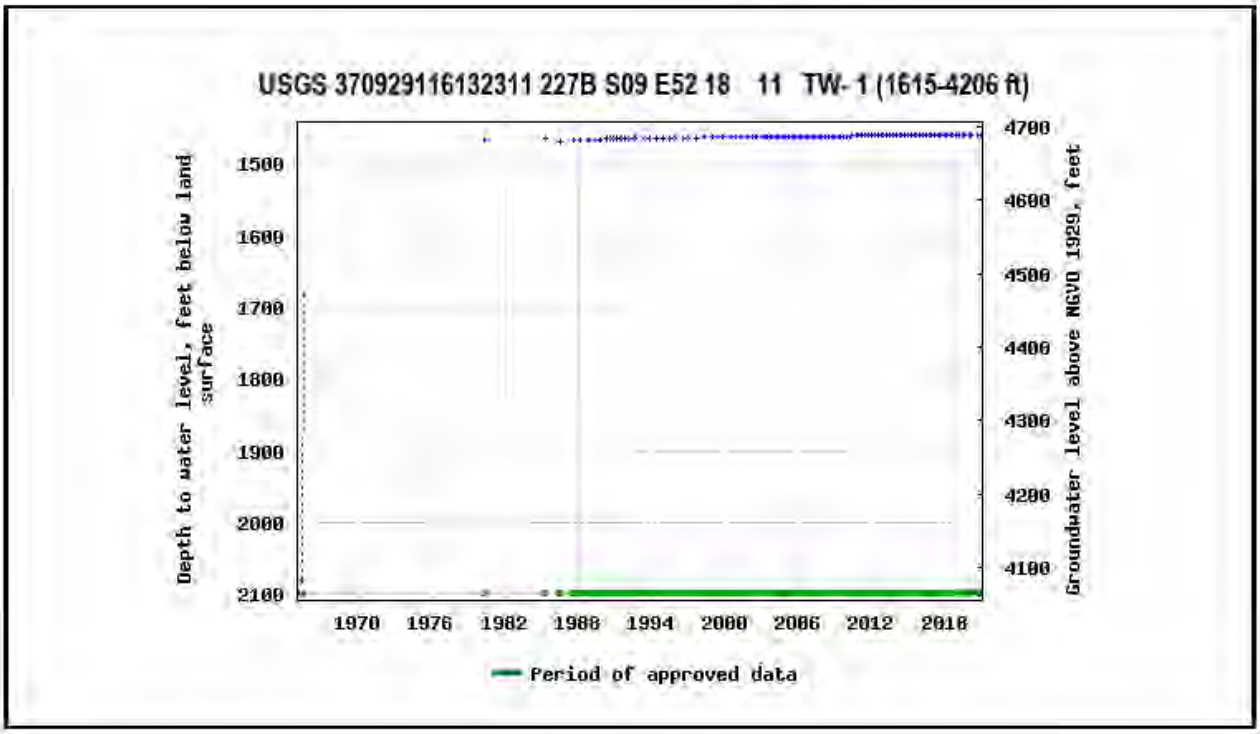

Figure B-6
Water Levels in TW-1_m1

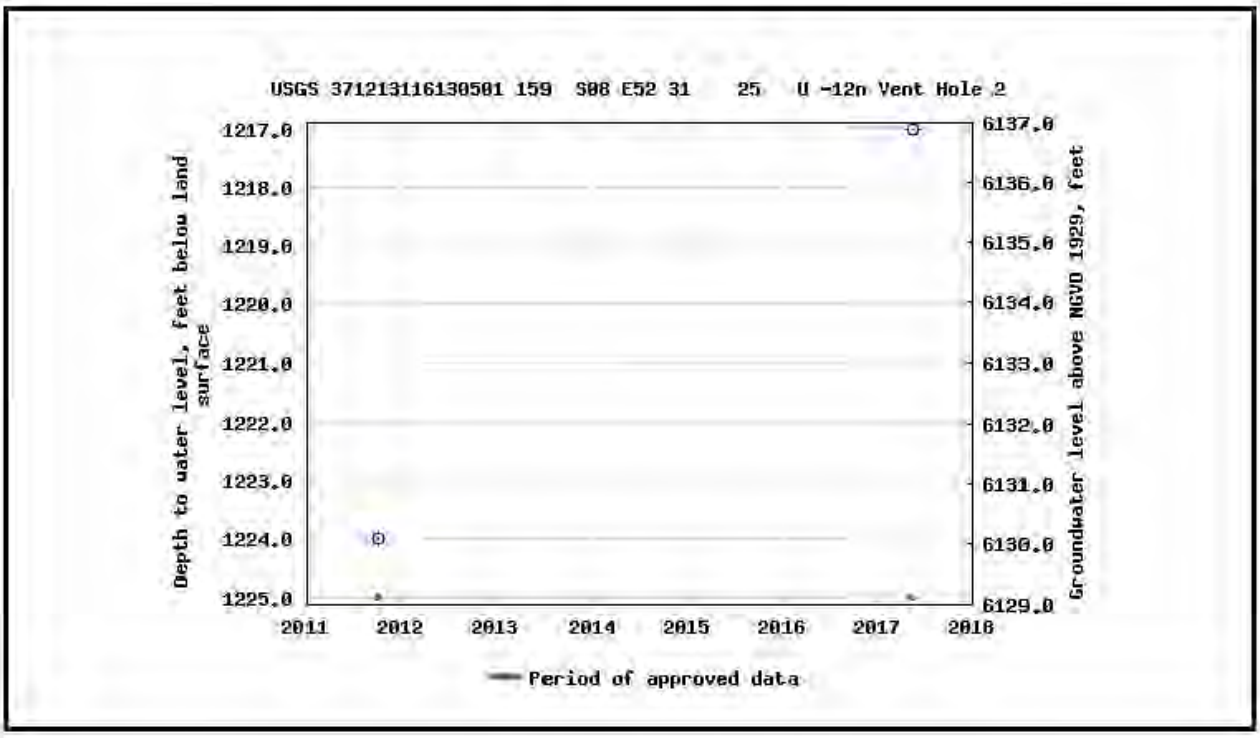

Figure B-7
Water Levels in U-12n Vent Hole 2_o1

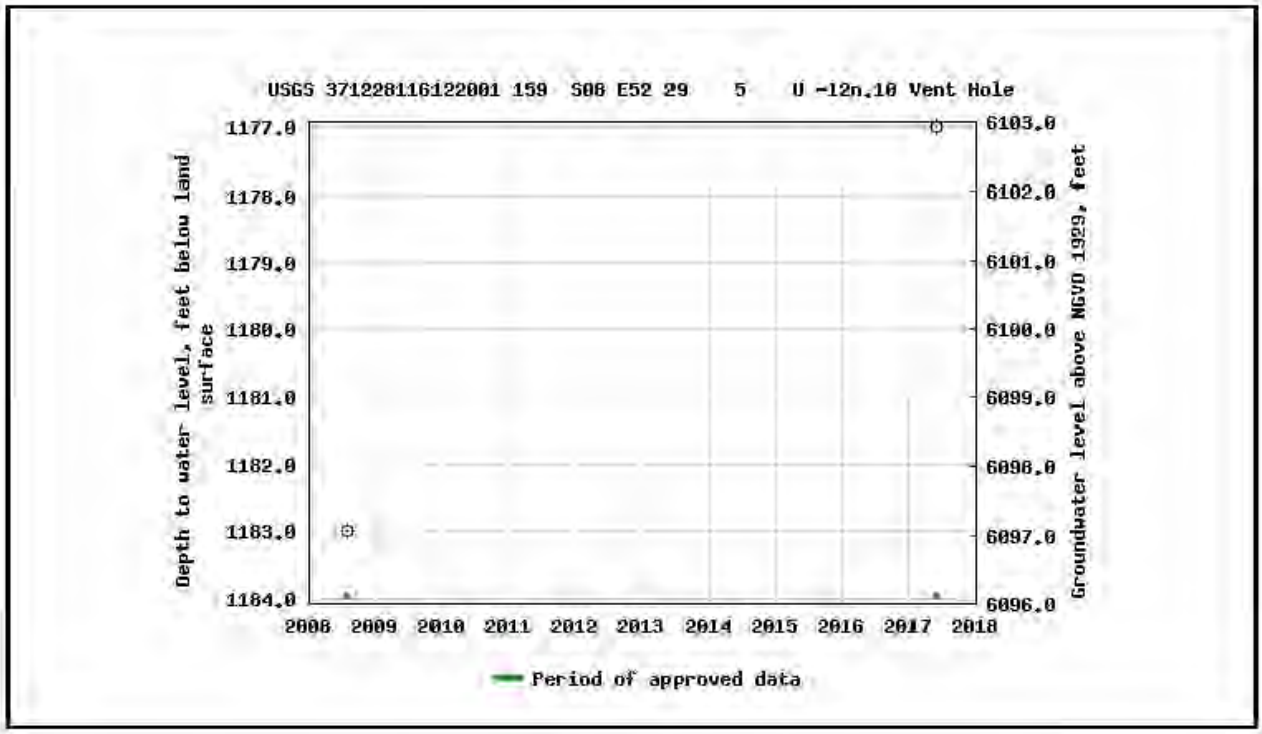

Figure B-8
Water Levels in U-12n.10 Vent Hole_o1

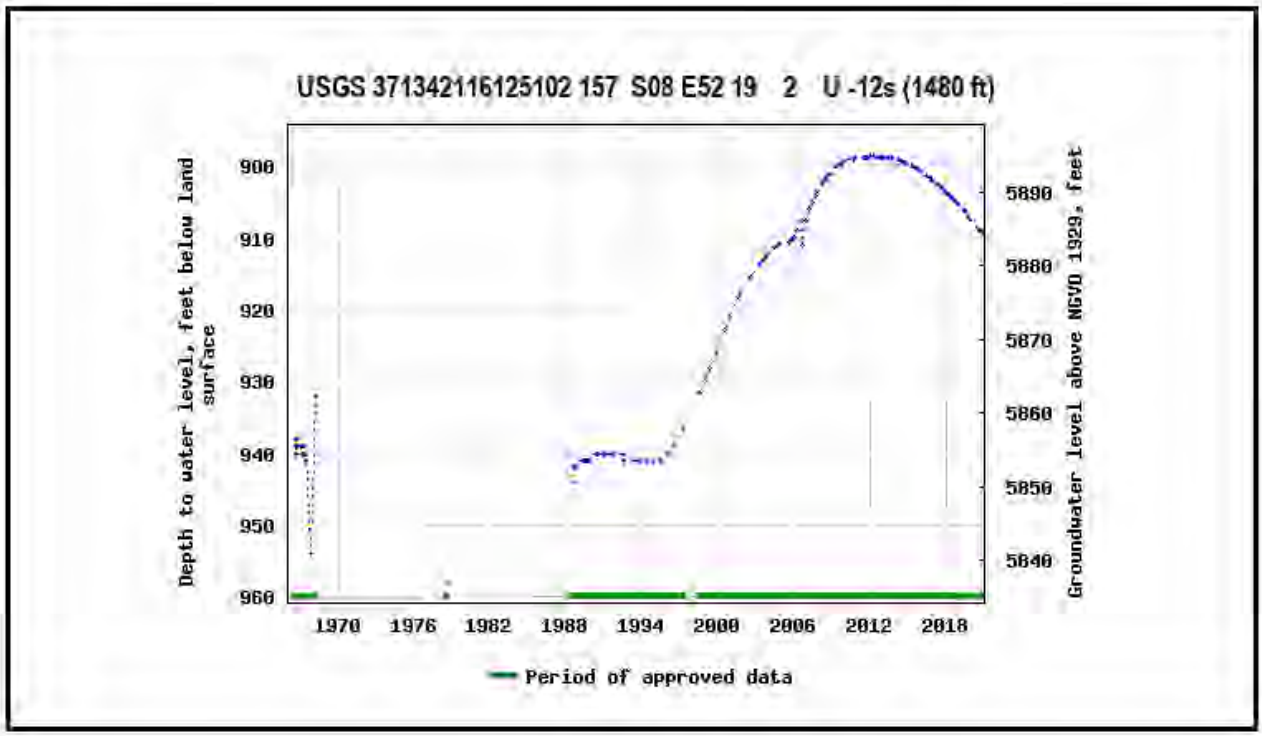

Figure B-9
Water Levels in U-12s_o1

B.2.0 References

USGS and DOE, see U.S. Geological Survey and U.S. Department of Energy.

U.S. Geological Survey and U.S. Department of Energy. 2021. "USGS/U.S. Department of Energy Cooperative Studies in Nevada" web page. As accessed at https://nevada.usgs.gov/doe_nv/ on 25 January.

Appendix C

Institutional Control Information

C.1.0 Institutional Controls

Correspondence and information regarding the URs and institutional controls in place for CAU 99 are as follows:

- Navarro and the M&O contractor purged Wells ER-12-1, ER-12-3, ER-12-4, and WW-8 during groundwater sampling in CY 2020. The purge volumes are reported in Table 2-1. Total gallons purged in RM and SM during groundwater sampling was 364,879 gal.

- Email from A. Sullivan (NDWR) to C. Birney (Navarro), dated February 9, 2021, responding to the question of whether or not NDWR is aware of any upcoming large-scale projects or other changes that could involve significant increases/decreases in groundwater pumping activity in the region that have not yet reached the application phase. NDWR is not aware of any large-scale projects planned. (See Attachment C-1.)

- NDWR Hydrographic Basin Summary By Manner of Use tables for Crater Flat (229), Emigrant Valley-Groom Lake Valley (158A), Emigrant Valley-Papoose Lake Valley (158B), Fortymile Canyon-Buckboard Mesa (227B), Frenchman Flat (160), Kawich Valley Basin (157), Oasis Valley (228) and Yucca Flat Basin (159). (See Attachment C-1.)

- Email from K. Ortego (MSTS) to C. Birney (Navarro), dated February 23, 2021, responding to question of water production in the RM/SM CAU. The only active production/water-supply well close to RM/SM CAU is WW-8 (See Attachment C-1.)

- Email from K. Ortego (MSTS) to C. Birney (Navarro), dated March 1, 2021, responding to question of water production in the RM/SM CAU. There are no active production/water-supply well in the RM/SM CAU. (See Attachment C-1.)

- Email from K. Ortego (MSTS) to C. Birney (Navarro), dated March 1, 2021, describing water withdrawal activities and responses to REOP Risk and Hazard Questionnaire questions 9H and 9I. There were no positive answers to question 9H. There was a positive answer to question 9I. (See Attachment C-1.)

- List of REOPs (provided by email from K. Stringfellow [MSTS] to C. Birney [Navarro]), dated February 17, 2021. (See Attachment C-1.)

- UR information from the RM/SM CR (DOE/EMNV, 2020). (See Attachment C-1.)

C.2.0 References

Nevada Division of Water Resources. 2021. "Underground Active Basin Summaries." As accessed at http://water.nv.gov/UndergroundActive.aspx on 18 February.

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Ortego, P.K., Mission Support and Test Services, LLC. 2021b. Email to C. Birney (Navarro) titled "REOP risk hazard questions 9h and 9i regarding Rainier Mesa/Shoshone Mountain" 1 March. Las Vegas, NV.

Stringfellow, K., Mission Support and Test Services, LLC. 2021. Email to C. Birney (Navarro) titled "REOP info for Rainier Mesa/Shoshone Mountain (CAU 99)," including Active_REOPs_RMSM_CAU99.xlsx Excel spreadsheet, 17 February. Las Vegas, NV.

Sullivan, A., Nevada Division of Water Resources. 2021. Email to C. Birney (Navarro) titled "RE: Request for info - Rainier Mesa/Shoshone Mountain," 9 February. Carson City, NV.

U.S. Department of Energy Environmental Management Nevada Program. 2020. *Underground Test Area (UGTA) Closure Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada*, Rev. 1, DOE/EMNV--0012. Las Vegas, NV.

Attachment C-1

Institutional Control Information

(35 Pages)

From:	Adam Sullivan
To:	Birney, Cathleen (CONTR); Dan Randles
Subject:	RE: Request for Info - Rainier Mesa/Shoshone Mountain
Date:	Tuesday, February 9, 2021 2:38:33 PM

Cathleen,
We are not aware of any upcoming large-scale projects that could involve significant increases/decreases in groundwater pumping in the region.

Adam

From: Birney, Cathleen (CONTR) <Cathleen.Birney@EMNV.DOE.GOV>
Sent: Thursday, February 4, 2021 3:27 PM
To: Adam Sullivan <asullivan@water.nv.gov>; Dan Randles <drandles@water.nv.gov>
Subject: Request for Info - Rainier Mesa/Shoshone Mountain

Hi Adam,
My name is Cathleen Birney and I work for Navarro, a contractor to the U.S. Department of Energy, Environmental Management Nevada (DOE/EMNV) Program. I am working on the Rainier Mesa/Shoshone Mountain post-closure monitoring report and on behalf of the DOE/EMNV Program, this is a request for information regarding upcoming activities that could affect groundwater in the Rainier Mesa/Shoshone Mountain area.

As a reminder, contaminants from nuclear testing are present in this basin, and a geographic contaminant boundary has been established in agreement with the Nevada Division of Environmental Protection, based on an extensive testing program. Should there be any significant changes to the current groundwater system, the boundary could be affected, and additional data collection and modeling may be necessary to evaluate potential boundary changes. Activities of significant magnitude to affect the groundwater system within the Rainier Mesa/Shoshone Mountain area are not expected, but the DOE is following this protocol to ensure its awareness of potential impacts.

In order to monitor groundwater usage in the area, we regularly carry out the following tasks:

- check information available on newly-filed applications on the http://water.nv.gov/ website
- send this email to you to ask if you are aware of any upcoming large-scale projects or other changes that could involve significant increases/decreases in groundwater pumping activity in the region, but have not yet reached the application phase.

The nearest basins we believe are most likely to be locations of new activities are:

- Frenchman Flat – Basin 160
- Fortymile Canyon – Basins 227B
- Kawitch Valley – Basin 157
- Emigrant Valley – Basins 158A and 158B
- Yucca Flat – Basin 159
- Oasis Valley – Basin 228

- Crater Flat – Basin 229

Note that the Rainier Mesa_Shoshone Mtn pdf (attached) shows three groundwater basins that are not listed on the NDWR website.

In addition, significant changes to water pumping rates on the Nevada National Security Site or the Nevada Test and Training Range are also of interest. Please see the attached maps for a visual representation of the region. Thank you for your help with this program. If you have changes in staffing, please let us know who should receive this email. We would like to have two contacts in place with the Nevada Division of Water Resources to make certain at least one person receives this information request.

Additional information regarding DOE's investigations in Rainier Mesa/Shoshone Mountain area and this monitoring of groundwater usage can be found in the report DOE/EMNV--012, *Underground Test Area (UGTA) Closure Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada*, 2020.

Thank you for your help,
Cathleen

Cathleen Birney, PG, CEM
Navarro, contracted to
U.S. Department of Energy
Environmental Management Nevada Program
(702) 724-0843
100 N. City Parkway, Ste. 1750, Las Vegas, NV 89106
Cathleen.birney@emnv.doe.gov

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 229
Hydrographic Region: 14 DEATH VALLEY BASIN
Basin Name: CRATER FLAT

Yield: 24000 **AFA**
Reference: USGS Recon. 54
Remarks: Combined Yield for Basins 225 thru 230

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	61.38	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	486.32	0.00	0.00	229.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	547.70	0.00	0.00	229.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y

Basin Remarks: Basin is Nellis AFB Bombing & Gunnery Range

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:47:56 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 158A
Hydrographic Region: 10 CENTRAL
Basin Name: EMIGRANT VALLEY-GROOM LAKE VALLEY

Yield: 2800 **AFA**
Reference: Water for Nevada Report No. 3
Remarks:

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	12.32	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	12.32	0.00	0.00	0.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y

Basin Remarks: Small Part of Basin in Nevada Test Site Part of Basin in Nellis AFB Bombing & Gunnery Range; Small Part of Basin in Desert National wildlife Range.

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:32:23 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 158B
Hydrographic Region: 10 CENTRAL
Basin Name: EMIGRANT VALLEY-PAPOOSE LAKE VALLEY

Yield: 10 **AFA**
Reference: USGS Recon. 54
Remarks:

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.00	0.00	0.00	0.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y

Basin Remarks: Small Part of Basin in Nevada Test Site Part of Basin in Nellis AFB Bombing & Gunnery Range; Small Part of Basin in Desert National wildlife Range.

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:33:52 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 227B
Hydrographic Region: 14 DEATH VALLEY BASIN
Basin Name: FORTYMILE CANYON-BUCKBOARD MESA

Yield: 24000 **AFA**
Reference: USGS Recon. 54
Remarks: Combined Yield for Basins 225 thru 230

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.00	0.00	0.00	0.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y
Basin Remarks:

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:35:19 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 160
Hydrographic Region: 10 CENTRAL
Basin Name: FRENCHMAN FLAT

Yield: 100 **AFA**
Reference: Water for Nevada Report No. 3
Remarks:

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.00	0.00	0.00	0.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y 01/12/2006

Basin Remarks: Part of Basin in Nevada Test Site; Part of Basin in Nellis AFB Bombing & Gunnery Range; Part of Basin in Desert National wildlife Range.

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:17:06 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 157
Hydrographic Region: 10 CENTRAL
Basin Name: KAWICH VALLEY

Yield: 2200 **AFA**
Reference: Water for Nevada Report No. 3
Remarks:

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	22.74	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	22.74	0.00	0.00	0.00	0.00	0.00

Basin Status:
Supplementally Adjusted? Y
Basin Remarks:

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:37:50 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 228
Hydrographic Region: 14 DEATH VALLEY BASIN
Basin Name: OASIS VALLEY

Yield: 24000 **AFA**
Reference: USGS Recon. 54
Remarks: Combined Yield for Basins 225 thru 230

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	5.52	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	74.60	0.00	0.00	0.00	0.00	0.00
Mining and Milling	40.82	0.00	0.00	20.00	0.00	0.00
Municipal	933.06	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	50.00	0.00	0.00	0.00	0.00	0.00
Stockwater	2.21	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	1,106.21	0.00	0.00	20.00	0.00	0.00

Basin Status: PARTLY DESIGNATED **Supplementally Adjusted?** Y
Basin Remarks: Part of Basin is in Nevada Test Site; Part of Basin in Nellis AFB Bombing & Gunnery Range

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:47:13 AM

Nevada Division of Water Resources

Hydrographic Basin Summary By Manner Of Use

Hydrographic Basin: 159
Hydrographic Region: 10 CENTRAL
Basin Name: YUCCA FLAT

Yield: 350 **AFA**
Reference: Water for Nevada Report No. 3
Remarks:

	Active Annual Duty*			Pending Annual Duty*		
Manner of Use	**Groundwater**	**Geothermal**	**Other Ground Water**	**Groundwater**	**Geothermal**	**Other Ground Water**
Commercial	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Environmental	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Power	0.00	0.00	0.00	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00	0.00	0.00	0.00
Recreation	0.00	0.00	0.00	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.00	0.00	0.00	0.00	0.00	0.00

Basin Status: **Supplementally Adjusted?** Y

Basin Remarks: Basin is in the Nevada Test Site.

* may include supplemental duties as well as duties associated with applications to change

2/18/2021 11:39:09 AM

From:	Ortego, Paul (CONTR)
To:	Birney, Cathleen (CONTR)
Subject:	Copy of WW CY2020 production.xlsx
Date:	Tuesday, February 23, 2021 10:08:57 AM
Attachments:	Copy of WW CY2020 production.xlsx

Cathleen,

Attached is a spreadsheet of water production for your CY2020 post closure reports. Wells 4, 4A, 5B & 5C for FF, UE-16D for YF and WW-8, in Area 18 which I'm not sure is considered to be in RM or PM.

You should have all the other "official data" from UGTA wells that were produced and sampled during CY 2020. So, this should be all the water production data you need for your FF, YF, and RM reports.

Later today I will begin providing some of the other information you requested for the individual CAUs.

Please call or email if you have any other questions at this point.

Ken
702-232-1244

CY 2020	5B	4A	4	5C	UE-16D	WW-8
jan	4,266,657	1,909,043	2,294,029		2,569,243	407,657
feb	3,935,071	2,553,186	3,177,786		2,976,229	594,029
mar	3,003,000	1,916,086	1,645,271		2,753,586	934,986
apr	2,871,157	1,165,786	1,065,886	14,700	50,486	1,700
may	3,330,214	3,074,543	826,400		145,857	848,443
jun	4,068,914	2,173,929	2,875,086		3,156,429	1,179,214
jul	4,647,314	3,045,386	2,794,829		3,750,357	810,029
aug	4,368,457	3,261,186	3,073,629		3,538,900	1,125,400
sep	4,082,300	2,887,557	2,604,657		3,738,486	878,014
oct	3,859,114	2,542,529	2,392,529		1,302,629	852,300
nov	3,122,500	2,554,371	1,690,586	1,800	1,209,500	611,200
dec	3,127,171	1,501,414	1,800,286		924371	312200
annual totals	44,681,869	28,585,016	26,240,974	16,500	26,116,073	8,555,172

From: Ortego, Paul (CONTR)
To: Birney, Cathleen (CONTR)
Subject: REOP risk hazard questions 9h and 9i regarding Rainier Mesa/Shoshone Mountain
Date: Monday, March 1, 2021 1:08:02 PM

Cathleen,

I have reviewed all of the REOP submittals during CY 2020. There were no positive answers to Risk 9h. There was a positive answer to Risk 9i during CY 2020 for work planned for CY 2021 for instrument/core holes in P Tunnel. These instrument/core holes are being drilled well above the water table without any impact to the RM hydrographic environment. There may be similar additional instrument/core hole drilling from P Tunnel later during CY 2021, but no impact is expected.

Please let me know if there is any other information you need at this time.

Thanks,
Ken

From: Ortego, Paul (CONTR)
To: Birney, Cathleen (CONTR)
Subject: Water Supply/Production Wells in RM/SM CAU
Date: Monday, March 1, 2021 2:53:19 PM

Cathleen,

This email is to confirm that there are no supply/production wells within the RM/SM CAU.

Thanks,
Ken

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
RM Primary REOPs			
DOE-0022	GPR Program	12-ML0231, Area 12	https://ntsweb.nv.doe.gov/docs/reops/doe/doe002200.pdf
MSTS-0016	NNSS Water Systems		https://ntsweb.nv.doe.gov/docs/reops/msts/msts001600.pdf
MSTS-0041	Radio Communications Infrastructure	12-025496, WETOK Benchmark	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS004100.pdf
		12-038194, DOE Station Comm Site	
MSTS-0055	NNSS Power Distribution Infrastructure		https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS005500.pdf
MSTS-0075	NNSS Balance of Plant	90-ML0015, NNSS Balance of Plant	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS007500.pdf
MSTS-0121	Post-Closure Inspections and Maintenance (NNSS)	CAU 137 CAS 12-08-01	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS012100.pdf
		12-06-02,09,12-08-02,12-28-01,12-25-13,12-23-01	
		CAU 383 CAS 12-06-06, 12-25-02, 12-28-02	
		CAU 477 CAS 12-06-03	
		12-01-09, 12-06-05, 12-06-07, 12-06-08, 12-23-10	
		CAU 574 CAS 12-45-01	
MSTS-0145	Underground Test Area Project	ER-12-3	https://ntsweb.nv.doe.gov/docs/reops/msts/msts014500.pdf
		ER-12-4	
		U-12n.10 Vent Hole	
		U-12n Vent Hole #2	
		U-12t #6	

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
MSTS-0147	U12G Tunnel	12-G-Tunnel	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS014700.pdf
MSTS-0184	Multi-Purpose Training Complex	12-ML0214, A12 Launch Site 1	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS018400.pdf
		12-ML0215, Area 12 Launch Site 2	
		12-ML0216, A12 Recovery Site	
MSTS-0269	Base Ops	18-ML0004, Cat Canyon	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS026900.pdf
MSTS-0274	U12V Tunnel/Support Facilities	12-ML0037, U12V Mission Generator Land	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS027400.pdf
		12-ML0036, U12V Tunnel Land Area	
MSTS-0279	NNSS Roads and Grounds	90-INF1700, Roads and Paved Parking	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS027900.pdf
MSTS-0285	U12P Tunnel & Support Buildings	12-ML0139, P Tunnel Compound	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS028500.pdf
MSTS-0400	U12u Tunnel	12-U12u	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS040000.pdf
MSTS-0439	Ecological & Environmental Monitoring	BECAMP RAM001	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS043900.pdf
		Beatley 64, BECAMP RAM002	
		EMAC PIMO-ARNO 3	
		EMAC PIMO-ARNO 4	
		EMAC PIMO-ARTR 5	
		EMAC PIMO-ARTR 6	
MSTS-0453	Excessed/Shutdown Facilities	12-358	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS045300.pdf
		12-B100944	
RM Secondary REOPs			

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
ARLSORD-0001	Weather Support for the NNSS	A-12 Universal Rain B7	https://ntsweb.nv.doe.gov/docs/reops/ARLSORD/ARLSORD000100.pdf
		A-12 MEDA 40	
DoD_DASDP-0001	LL Air Operations & Remote Landing Areas	12-ML0214, A12 Launch Site 1	https://ntsweb.nv.doe.gov/docs/reops/DODDASDP/DODDASDP000100.pdf
		12-ML0215, A12 Launch Site 2	
		12-ML0216, A12 Recovery Site	
DOD-0010	Base Operations	18-ML0004, Cat Canyon	https://ntsweb.nv.doe.gov/docs/reops/dod/dod001000.pdf
DTRA-0060	Tunnel Furnishing	U12u Tunnel	https://ntsweb.nv.doe.gov/docs/reops/DTRA/DTRA006000.pdf
DTRA-0062	Heavy Vehicle Testing	P-Tunnel Access Road	https://ntsweb.nv.doe.gov/docs/reops/DTRA/DTRA006200.pdf
		U12t	
		U-12g	
		Sensor 7	
		Sensor 8	
		Sensor 9	
		Sensor 6	
		Sensors 11, 12, 41, 42	
		12-ML0139	
		Flat E	
		Flat W	

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
DTRA-0064	Exterior LIDAR Scanning of Tunnels	12-ML0139, P Tunnel Compound	https://ntsweb.nv.doe.gov/docs/reops/DTRA/DTRA006400.pdf
		U12v Tunnel Area	
		U12e Tunnel Area	
		U12n Tunnel Area	
		U12b, c, d Tunnel Area	
		U12t Tunnel Area	
		U12t Tunnel Area	

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
JLON-0080	LLNL Low Yield Nuclear Monitoring (LYNM) Physics Experiment 1 (PE1)	Met tower #1/Piñon flux tower	https://ntsweb.nv.doe.gov/docs/reops/JLON/JLON008000.pdf
		Met tower #2	
		Met tower #3	
		Met tower #4	
		Met tower #5	
		Tripod Tower #1	
		Met tower #6	
		Profiling lidar #1	
		Scanning lidar location - r3	
		Mesa release #1	
		Mesa release #2	
		Mesa release #3	
		Mesa release #4	
		Apron release #1	
		Apron release #2	
		Tethered balloon	

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
MSTS_S-0023	NNSS Seismic Network	SPE Actual Sites - L5-28	https://ntsweb.nv.doe.gov/docs/reops/MSTSS/MSTSS002300.pdf
		Geophone Sites - A-12	
		PSDHY	
		Tower 2	
		Tower 3	
		Tower 4	
		Tower 4b	
		Tower 5	
		Tower 6	
		Tower 1a	
MSTS_S-0035	ADAPD	12-ML0139, P Tunnel Compound	https://ntsweb.nv.doe.gov/docs/reops/MSTSS/MSTSS003500.pdf
NAV-0026	Navarro UGTA Field Operations	ER-12-3	https://ntsweb.nv.doe.gov/docs/reops/NAV/NAV002600.pdf
		ER-12-4	
		U-12n.10 Vent Hole	
		U-12n Vent Hole #2	
		U-12t #6	
NNSA-0006	Disposition Forensics Evidence Analysis Team (DFEAT)	12-ML0139, P-Tunnel Compound	https://ntsweb.nv.doe.gov/docs/reops/nnsa/nnsa000600.pdf
USGS-0003	USGS Vegetation, Small Mammal and Reptile Studies	BECAMP RAM001	https://ntsweb.nv.doe.gov/docs/reops/usgs/usgs000300.pdf
		Beatley 64, BECAMP RAM002	

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
USGS-0005	Underground Test Area Activity (UGTA) and NNSS Well Data Collection	ER-12-3	https://ntsweb.nv.doe.gov/docs/reops/usgs/usgs000500.pdf
		ER-12-4	
		UE-12t6	
USGS-0009	Radio Tracking of Wildlife	12T-23 and 12T-26B	https://ntsweb.nv.doe.gov/docs/reops/USGS/USGS000900.pdf
		Dick Adams Cutoff Road	
SM Primary REOPs			
MSTS-0055	NNSS Power Distribution Infrastructure		https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS005500.pdf
MSTS-0075	NNSS Balance of Plant	90-ML0015, NNSS Balance of Plant	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS007500.pdf
MSTS-0121	Post-Closure Inspections and Maintenance (NNSS)	CAU 504 CAS 16-06-01, 16-23-01, 16-23-02, 16-99-01	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS012100.pdf
MSTS-0145	Underground Test Area Project	ER-16-1	https://ntsweb.nv.doe.gov/docs/reops/msts/msts014500.pdf
MSTS-0272	U16b Tunnel Complex	16-ML0058, ISE 3 Sensor Site	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS027200.pdf
		16-ML0066, Tippipah Peak Camera	
		90-ML0050, U16B Tunnel Land	
MSTS-0279	NNSS Roads and Grounds	90-INF1700, Roads and Paved Parking	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS027900.pdf
MSTS-0439	Ecological & Environmental Monitoring	EMAC PIMO-ARTR 12	https://ntsweb.nv.doe.gov/docs/reops/MSTS/MSTS043900.pdf
SM Secondary REOPs			

Active REOPs at RM/SM for CY 2020

REOP Number	REOP Name	REOP Description	REOP Document
DTRA-0064	Exterior LIDAR Scanning of Tunnels	90-ML0050, U16B Tunnel Land U16a Tunnel Area	https://ntsweb.nv.doe.gov/docs/reops/DTRA/DTRA006400.pdf
NAV-0026	Navarro UGTA Field Operations	ER-16-1	https://ntsweb.nv.doe.gov/docs/reops/NAV/NAV002600.pdf
USGS-0005	Underground Test Area Activity (UGTA) and NNSS Well Data Collection	ER-16-1	https://ntsweb.nv.doe.gov/docs/reops/usgs/usgs000500.pdf

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

General Information

Use Restriction (UR) Type(s):	FFACO Only
Corrective Action Unit (CAU) Number & Description:	99 - Rainier Mesa/Shoshone Mountain
Corrective Action Site (CAS) Number & Description:	See Attached Table
CAU/CAS Owner:	UGTA - ER
Note:	This FFACO UR is associated with 60 Rainier Mesa CASs in CAU 99. See attached table.

Section I. *Federal Facility Agreement and Consent Order* (FFACO) UR

Basis for FFACO UR

Summary Statement: This FFACO UR is established to protect workers from inadvertent exposure to radiological contaminants that were released at this site. Radiological contaminants are present that are assumed to exceed action levels.

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

FFACO UR Physical Description

Surveyed Area (UTM, Zone 11, NAD 83, meters):

UR Boundary	UR Point[1]	Easting[2]	Northing[2]
FFACO Boundary	1	565,372	4,111,363
	2	564,677	4,113,409
	3	565,501	4,116,915
	4	568,288	4,119,282
	5	570,197	4,119,363
	6	571,656	4,120,521
	7	574,282	4,122,916
	8	575,193	4,122,912
	9	576,350	4,121,441
	10	577,412	4,119,724
	11	576,578	4,117,428
	12	571,016	4,112,748
	13	565,372	4,111,363

[1]UR Points are listed clockwise beginning at the southernmost point. If multiple points share the southernmost Northing coordinate, the easternmost point is listed as Point 1.

[2]UR Coordinate values presented herein were captured in North American Datum of 1983, and rounded to the nearest meter when necessary; due to that rounding, coordinates may not reflect the original precision of values contained within the source GIS data set.

Boundary Applies to: Subsurface

Depth is unknown.

Survey Source: GIS

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

FFACO UR Requirements

Site Controls:

This FFACO UR is recorded as described in **Section IV. Recordation Requirements** to restrict activities within the area by the coordinates listed above and depicted in the attached figure without prior notification of NDEP unless the activities are conducted under the provisions of 10 CFR, Part 835, Occupational Radiation Protection and 10 CFR, Part 851, Worker Safety and Health Program.

Control	Criteria
Real Estate/Operations Permit (REOP) Risk Hazard	Review the REOP Risk Hazard question responses related to groundwater activities (questions 9h and 9i) within the UR boundary.

Inspection Frequency: Annual

Additional Considerations:

Consideration	Criteria
Monitoring Data	Review UR boundaries based on monitoring data during the periodic evaluations.

Requirements Comments: The surface is uncontaminated. Use restriction depth begins at the water table.

Section II. Administrative UR

An Administrative UR is not identified for this site.

Section III. Supporting Documentation

UR Source Document(s)

U.S. Department of Energy, Environmental Management Nevada Program. 2020. Underground Test Area (UGTA) Closure Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada, Rev. 0, DOE/EMNV--0012. Las Vegas, NV.

Attachments

- CAU 99 FFACO UR Associated Corrective Action Sites - Rainier Mesa
- FFACO UR Boundary Map (UTM, Zone 11, NAD 83 meters)

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

Section IV. Recordation Requirements

Recordation:

The above UR(s) are recorded in the:

- FFACO Database
- NNSA M&O Contractor GIS
- EM Nevada Program CAU/CAS Files

Section V. EM Nevada Program Approval

/s/ John Myers

Date: 3/11/2020

John Myers

Activity Lead

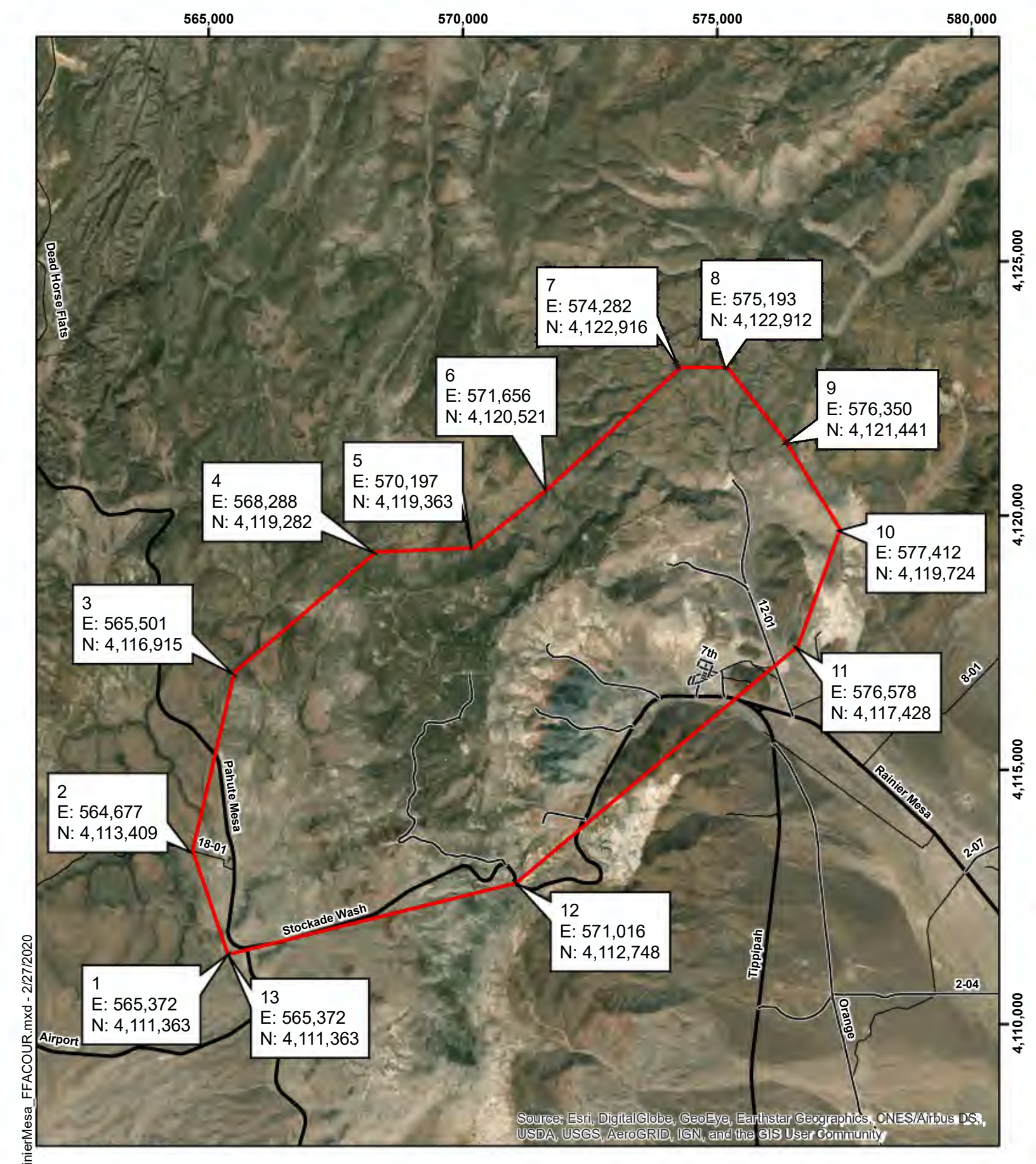
EM Nevada Program

CAU 99 FFACO UR Associated Corrective Action Sites
Rainier Mesa

CAS Number	CAS Description
12-57-001	U-12b Cavity
12-57-002	U-12b.02 Cavity
12-57-003	U-12b.04 Cavity
12-57-004	U-12b.08 Cavity
12-57-005	U-12b.09 Cavity
12-57-006	U-12b.10 Cavity
12-57-007	U12c.02 Cavity
12-57-008	U-12c.03 Cavity
12-57-009	U12d.01 Cavity
12-57-010	U12c.01 Cavity
12-57-011	U-12e.02 Cavity
12-57-012	U-12e.03a Cavity
12-57-013	U-12e.05 Cavity
12-57-014	U-12e.10 Cavity
12-57-015	U-12e.11 Cavity
12-57-016	U-12e.12 Cavity
12-57-017	U-12e.14 Cavity
12-57-018	U-12e.18 Cavity
12-57-019	U-12f.01 Cavity
12-57-020	U12f.02 Cavity
12-57-021	U-12g.01 Cavity
12-57-022	U-12g.06 Cavity
12-57-023	U-12g.07 Cavity
12-57-024	U-12g.09 Cavity
12-57-025	U-12g.10 Cavity
12-57-026	U-12j.01 Cavity
12-57-027	U-12k.01 Cavity
12-57-028	U-12n.02 Cavity
12-57-029	U-12n.04 Cavity
12-57-030	U-12n.05 Cavity
12-57-031	U-12n.06 Cavity

CAU 99 FFACO UR Associated Corrective Action Sites
Rainier Mesa

CAS Number	CAS Description
12-57-032	U-12n.07 Cavity
12-57-033	U-12n.08 Cavity
12-57-034	U-12n.09 Cavity
12-57-035	U-12e.20 Cavity
12-57-036	U-12n.10 Cavity
12-57-037	U-12n.10a Cavity
12-57-038	U-12n.11 Cavity
12-57-039	U-12n.12 Cavity
12-57-040	U-12n.15 Cavities (2)
12-57-041	U-12n.17 Cavity
12-57-042	U-12n.18 Cavity
12-57-043	U-12n.19 Cavity
12-57-044	U-12n.20 Cavity
12-57-045	U-12n.21 Cavity
12-57-046	U-12n.22 Cavity
12-57-047	U-12n.23 Cavity
12-57-048	U-12n.24 Cavity
12-57-049	U-12p.02 Cavity
12-57-050	U-12p.03 Cavity
12-57-051	U-12p.04 Cavity
12-57-052	U-12p.05 Cavity
12-57-053	U-12q Cavity
12-57-054	U-12r Cavity
12-57-055	U-12t.01 Cavity
12-57-056	U-12t.02 Cavity
12-57-057	U-12t.03 Cavity
12-57-058	U-12t.04 Cavity
12-57-060	U-12t.08 Cavity
12-57-061	U-12t.09 Cavity



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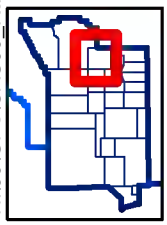


CAU 99,
Rainier Mesa/Shoshone Mountain
Rainier Mesa
FFACO UR Boundary

Explanation

- FFACO UR
- Paved Road
- Light Duty Road
- Unimproved Road

0 750 1,500 3,000 Meters

0 4,000 8,000 16,000 Feet

N

Source: Navarro GIS, 2020

Uncontrolled When Printed

Coordinate System: NAD 1983 UTM Zone 11N, Meter

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

General Information

Use Restriction (UR) Type(s):	FFACO Only
Corrective Action Unit (CAU) Number & Description:	99 - Rainier Mesa/Shoshone Mountain
Corrective Action Site (CAS) Number & Description:	See Attached Table
CAU/CAS Owner:	UGTA - ER
Note:	This FFACO UR is associated with 6 Shoshone Mountain CASs in CAU 99. See attached table.

Section I. *Federal Facility Agreement and Consent Order* (FFACO) UR

Basis for FFACO UR

Summary Statement: This FFACO UR is established to protect workers from inadvertent exposure to radiological contaminants that were released at the site. Radiological contaminants are present that are assumed to exceed action levels.

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

FFACO UR Physical Description

Surveyed Area (UTM, Zone 11, NAD 83, meters):

UR Boundary	UR Point[1]	Easting[2]	Northing[2]
FFACO Boundary	1	570,594	4,093,893
	2	569,769	4,093,944
	3	569,490	4,094,426
	4	569,732	4,095,291
	5	569,387	4,096,946
	6	570,149	4,097,153
	7	570,492	4,097,633
	8	571,947	4,097,716
	9	572,653	4,096,379
	10	573,102	4,095,626
	11	572,474	4,094,318
	12	570,594	4,093,893

[1]UR Points are listed clockwise beginning at the southernmost point. If multiple points share the southernmost Northing coordinate, the easternmost point is listed as Point 1.

Boundary Applies to: Subsurface

Depth is unknown.

Survey Source: GIS

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

FFACO UR Requirements

Site Controls:

This FFACO UR is recorded as described in **Section IV. Recordation Requirements** to restrict activities within the area by the coordinates listed above and depicted in the attached figure without prior notification of NDEP unless the activities are conducted under the provisions of 10 CFR, Part 835, Occupational Radiation Protection and 10 CFR, Part 851, Worker Safety and Health Program.

Control	Criteria
Real Estate/Operations Permit (REOP) Risk Hazard	Review the REOP Risk Hazard question responses related to groundwater activities (questions 9h and 9i) within the UR boundary.

Inspection Frequency: Annual

Additional Considerations:

Consideration	Criteria
Monitoring Data	Review UR boundaries based on monitoring data during the periodic evaluations.

Requirements Comments: The surface is uncontaminated. Use restriction depth begins at the water table.

Section II. Administrative UR

An Administrative UR is not identified for this site.

Section III. Supporting Documentation

UR Source Document(s)

U.S. Department of Energy, Environmental Management Nevada Program. 2020. Underground Test Area (UGTA) Closure Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada, Rev. 0, DOE/EMNV--0012. Las Vegas, NV.

Attachments

- CAU 99 FFACO UR Associated Corrective Action Sites - Shoshone Mountain
- FFACO UR Boundary Map (UTM, Zone 11, NAD 83 meters)

U.S. Department of Energy, Environmental Management Nevada Program
Use Restriction Information

Section IV. Recordation Requirements

Recordation:

The above UR(s) are recorded in the:

- FFACO Database
- NNSA M&O Contractor GIS
- EM Nevada Program CAU/CAS Files

Section V. EM Nevada Program Approval

/s/ John Myers

Date: 3/11/2020

John Myers

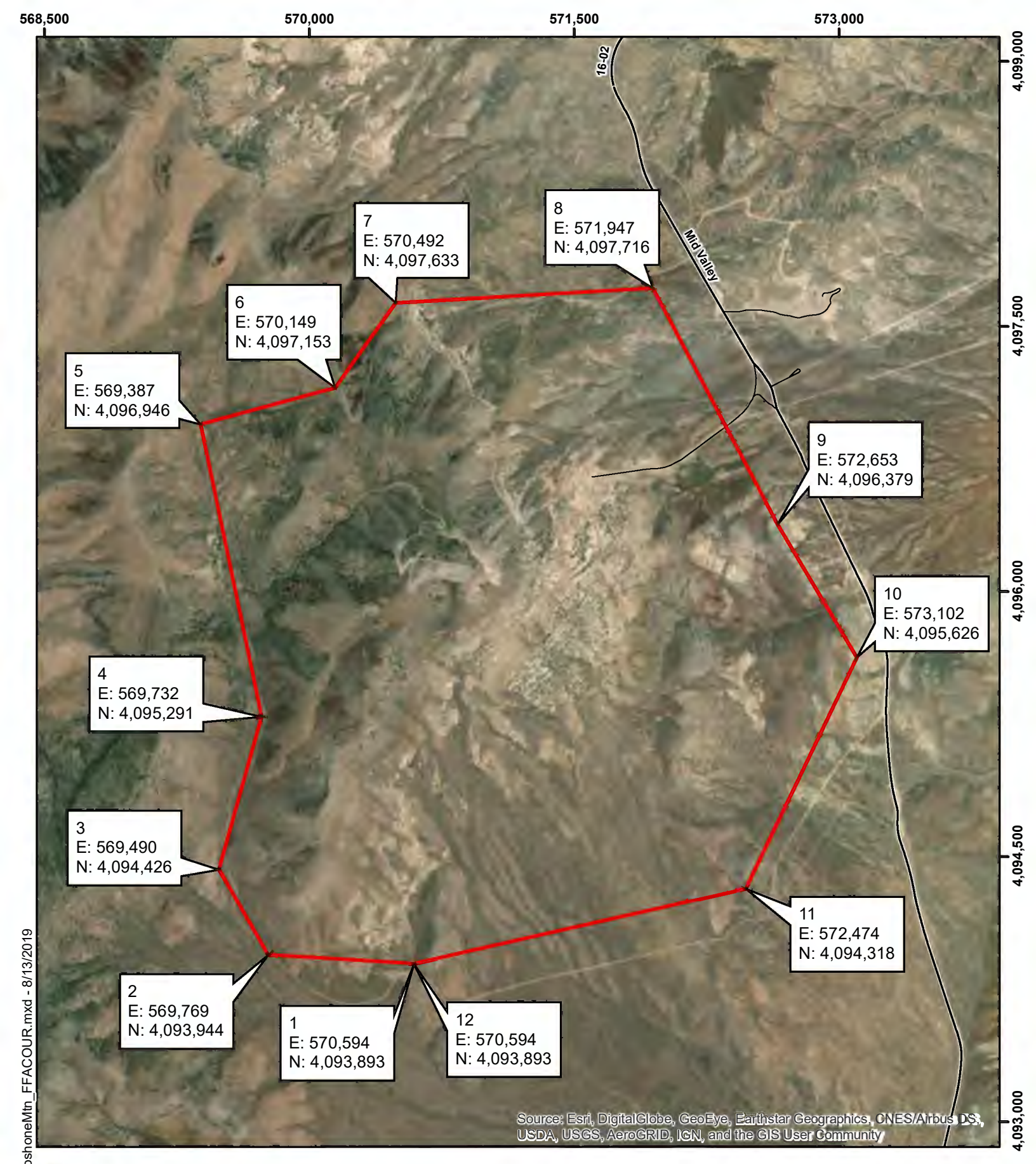
Activity Lead

EM Nevada Program

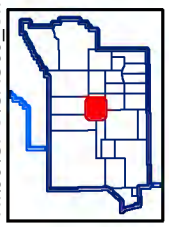
CAU 99 FFACO UR Associated Corrective Action Sites

Shoshone Mountain

CAS Number	CAS Description
16-57-001	U-16a Cavity
16-57-002	U-16a.02 Cavity
16-57-003	U-16a.03 Cavity
16-57-004	U-16a.04 Cavity
16-57-005	U-16a.05 Cavity
16-57-006	U-16a.06 Cavity



H:\99\GPS\CAU99_ShoshoneMtn_FFACOUR.mxd - 8/13/2019



CAU 99,
Rainier Mesa/Shoshone Mountain
Shoshone Mountain
FFACO UR Boundary

Explanation

- FFACO UR
- Light Duty Road
- Unimproved Road

0 250 500 1,000 Meters

0 1,000 2,000 4,000 Feet

N

Source: Navarro GIS, 2019

Uncontrolled When Printed

Coordinate System: NAD 1983 UTM Zone 11N, Meter

Appendix D

Nevada Division of Environmental Protection Comments

(7 Pages)

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021	2. Document Date: April 2021
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
1.	Section 2.0, Page 6, 3rd Paragraph, 1st Sentence		In reply to NDEP's comments on the Draft Annual Post-Closure Monitoring Letter Report for Calendar Year 2020 for CAUs 97, 98 and 99, this same sentence was changed to read: "Seven wells and two vent holes, with a total of nine completions ... " As this change is a correct description of the post-closure water-level monitoring network, it is requested that a similar wording change be made to this report.	Changed as requested.
2.	Section 2.1		Please explain in the text why the MDC differs for ^{3}H for various wells.	Added the following to Section 2.1, page 10, first paragraph, after second sentence: "As seen in the tables, minimum detectable concentrations (MDCs) of RNs can vary due to the laboratory performing the analyses, count time, instrument, method detection limit studies, and sample volume."

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021	2. Document Date: April 2021
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
3.	Section 2.1, Page 9, 1st Paragraph, 1st Sentence and Table 2-1, ER-12-3_m1 and ER-12-4_m1		It should be noted in either the first sentence or by footnote on the Table that samples from these two wells were obtained using an electric submersible pump (ESP) as all the other sampling points on the Table have a footnote to indicate how the sample was obtained.	Added footnote to table for ER-12-3_m1 and ER-12-4_m1 that these wells were sampled using an ESP. Re-lettered the other footnotes to follow the added footnote as noted below: a Sample collected with an electric submersible pump (ESP). b Sample collected with a bailer. c Sample collected by M&O contractor. d Grab sample.
4.	Section 2.1, Page 10, 1st Paragraph, 3rd Sentence and Page 11, Figure 2-3		Please add a notation on the Figure indicating the meaning of the two values presented on the Figure for some of the monitoring locations (e.g., Sampling Location U-12n Vent Hole 2_ol_al).	Figure annotated with footnote: "Note: Sampling locations with two ^{3}H results indicate sample and field duplicate results respectively" Also added to the sentence to clarify: "Figure 2-3 shows the sample, and where applicable, the FD ^{3}H results for the RM and SM sampling locations."
5.	Section 2.1.3, Page 14, 1st Full Paragraph, Last Sentence		When is it anticipated that the future approach to sampling Well ER-30-1 will be discussed and evaluated by the EM Nevada Program and NDEP?	No change in document. DOE will commit to discuss and evaluate the future sampling approach with NDEP by the end of FY21.

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021	2. Document Date: April 2021
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
6.	Section 2.1.5, Page 16, 1st Partial Paragraph, 2nd and 3rd Complete Sentences		For consistency, please add "field duplicate" to Note (1) below Table 2-7.	Added "FD" to Note (1). Field duplicate has been defined already, so will use FD. Tables 2-2, 2-14, and 2-15 also had FD results so the "Note (1)" was changed to FD to be consistent with Table 2.7.
7.	Section 2.1.6, Page 16, 2nd Paragraph, Last Sentence		Table 2-8 should follow this sentence and not be in Section 2.1. 7. Please correct this inconsistency.	Table 2-8 is now in Section 2.1.6.
8.	Section 2.1.11, Page 20, 2nd Paragraph, Last Sentence		Table 2-14 should follow this sentence and not be in Section 2.1.12. Please correct this inconsistency.	Table 2-14 is now in Section 2.1.11.

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021	2. Document Date: April 2021
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
9.	Section 2.2, Page 22, 2nd Paragraph, 1st Sentence		In reply to NDEP's comments on the Draft Annual Post-Closure Monitoring Letter Report for Calendar Year 2020 for CAUs 97, 98 and 99, this same sentence was changed to read: "Seven wells and two vent holes, with a total of nine completions ... " As this change is a correct description of the post-closure water-level monitoring network, it is requested that a similar wording change be made to this report.	Changed as requested.
10.	Section 3.0, Page 26, Last Sentence, Last Bullet and Section 5.0, Page 31, Last Paragraph, 1st Bullet		It is noted that while it is stated on Page 31, "No issues have been identified during well inspections that require immediate corrective actions.," it is also stated on Page 26 that the "Vegetation on the well pads will be removed before future sampling activities." Which may not be for another six years. There are also several instances on the Well Site Surveillance Forms in Appendix C where conditions have been marked as "not-optimal" through the checked-boxes and/or the Comments. Are there any plans for maintenance activities in these identified areas?	Changed the corrective action bullet on page 26 to read: "Vegetation on the well pads will be removed during well site cleanup activities and before future sampling activities." Note: these two insertions were added to be consistent with letter from NDEP. Navarro is in the process of conducting well site cleanup at wells within the RM/SM, YF/CM, and FF post-closure monitoring water-level and water-quality sampling network. Vegetation removal does not require an immediate corrective action, but the vegetation will be removed during the well site clean and prior to sampling. Items that are considered cosmetic or housekeeping, and which do not affect the serviceability of the well, are noted on the form and will be used for the well site cleanups.

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021	2. Document Date: April 2021
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov	9. Reviewer's Signature:

10. Comment Number/Location	11. Type[a]	12. Comment	13. Comment Response	
11. Section 3.0, Page 26, Last Paragraph, Last Bullet		In several instances on the Well Site Surveillance Forms in Appendix C, under Housekeeping, it is noted that trash/wood/pallets/wire/debris are present. Please explain in the text why removal of these is not considered a corrective action activity.	The second sentence of the first paragraph of Section 3.0 has been modified for clarification: "Water sampling wells, sumps, discharge areas, and areas surrounding the wells will be inspected for damage before groundwater sampling begins and inspected again after sampling is completed." Added the following after the second sentence: "Any condition that affects the serviceability of a well will be noted on the Well Site Surveillance form and reported for corrective action. Items that are considered cosmetic or housekeeping, and that do not affect the serviceability of the well, are noted on the surveillance form and will be used for the well site cleanup activities." Added below the nine bulleted items "In addition to the inspection items listed above, photos will be taken during the inspections to document the conditions of the well site." Added a column to Table 3-1 to indicate if photos were taken during well site surveillance to document site conditions.	

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada, Revision 0, April 2021				2. Document Date: April 2021
3. Revision Number: 0				4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead:				6. Date Comments Due:
7. Review Criteria: Full				
8. Reviewer/Organization Phone No.: Chris Andres candres@ndep.nv.gov ; Britt Jacobson bjacobso@ndep.nv.gov ; Nikita Lingenfelter nlingenfelter@ndep.nv.gov				9. Reviewer's Signature:
10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
12.	Section 4.0, Page 29, 2nd Paragraph, Last Two Sentences		Will the recording process be completed before the finalization of this report? If so, will these sentences then be updated?	Modified last two sentences with updated info: "The UR coordinates have been verified with the M&O contractor and have been posted in the M&O Geographic Information System. The URs have not been entered into the FFACO database yet; the recording process is planned to be completed in the near future (Dinsman, 2021). When the UR recording process is complete, NDEP will be notified."
13.	Appendix C, Well Site Surveillance Form for U-12n Vent Hole 2, Additional Comments		When will MSTS secure crane arm/cables from movement? This corrective action should be noted in the corrective action section.	MSTS has been contacted and the unsecured crane arm has been verified by MSTS personnel. Navarro and MSTS are working to secure the crane arm so that future work at the site is safer as this is a health and safety issue. However, DOE does not believe this issue affects the serviceability of the vent hole, or the validity of the sample collection process or sample results. DOE believes this issue does not need to be addressed directly in the report. Also, per the June 29, 2021 meeting, and follow-up emails, Appendix C (Well Site Surveillance Forms) is deleted from the report.

[a]Comment Types: M = Mandatory, S = Suggested.
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14. Appendix C, Well Site Surveillance Form for UE-18T, Additional Comments		Is a corrective action needed based on the comment that no rig anchors were noted? If yes, when will this be done? Also, if it needs to be done it should be noted in the corrective action section.	No corrective action needed for the lack of rig anchors on the well pad. Also, per the June 29, 2021 meeting, and follow-up emails, Appendix C (Well Site Surveillance Forms) is deleted from the report.

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