1.0 Introduction

This letter serves as the annual post-closure letter for Corrective Action Unit (CAU) 98, Frenchman Flat (FF); CAU 97, Yucca Flat/Climax Mine (YF/CM); and CAU 99, Rainier Mesa/Shoshone Mountain (RM/SM) for calendar year (CY) 2022. This letter will discuss the post-closure monitoring activities that occurred during CY 2022, identify any triggers reached, and summarize water usage on the Nevada National Security Site (NNSS) and surrounding hydrographic basins at the three CAUs.

1.1 CY 2022 Post-Closure Monitoring Activities

During CY 2022, post-closure monitoring activities were conducted at the FF, YF/CM, and RM/SM CAUs as indicated in the CAU-specific closure reports (CRs) and the FF five-year evaluation. Activities included the following:

- Measuring water levels in specified wells.
- Conducting well site surveillance at specified well sites.
- Sampling YF/CM Well WW C-1 for low-level tritium (^{3}H).
- Verifying use restrictions (URs) and institutional controls.
- Determining water usage on the NNSS and surrounding hydrographic basins.
- Identifying any triggers reached at the FF, YF/CM, and RM/SM CAUs.

This letter does not discuss routine post-closure sampling, which occurs at the FF, YF/CM, and RM/SM CAUs every six years. In CY 2020, five-year annual sampling was completed at the FF CAU, as identified in the CR, and an assessment of the five years of data was provided in the FF five-year evaluation report. The FF five-year evaluation report and recommendations were approved by the Nevada Division of Environmental Protection (NDEP) in May 2022. An addendum to the FF CR is being developed, which will outline the new closure requirements. The next routine post-closure sampling in the FF CAU will occur every six years and will be on the same schedule as the YF/CM and RM/SM CAUs. Therefore, the next routine sampling for the three CAUs is planned for CY 2026.

Sampling location maps for each CAU are included in the CAU-specific CRs. For each CAU, a closure monitoring report will be provided following the next set of routine sampling.

2.0 Water-Level Measurements

2.1 CAU 98, Frenchman Flat

The FF post-closure water-level monitoring network was revised following the recommendations discussed in the FF five-year evaluation report. Fifteen wells, with a total of 17 completions, are in the FF post-closure water-level monitoring network; these wells include the three Area 5 Radioactive Waste Management Complex (RWMC) pilot wells (Figure 2-1). The water levels are measured annually and in the same quarter of each year, if possible. In CY 2022, water levels were measured in the wells; the water levels are presented in Table 2-1.

2.2 CAU 97, Yucca Flat/Climax Mine

Twenty wells, with a total of 25 completions, are in the YF/CM post-closure water-level monitoring network (Figure 2-2), and are measured annually and in the same quarter of each year, if possible. In CY 2022, water levels were measured in the wells or were calculated from the long-term water-level monitoring (LTWLM) pressure transducers (PXDs). 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. The water levels are presented in Table 2-2.

2.3 CAU 99, Rainier Mesa/Shoshone Mountain

Five wells, with seven completions and two vent holes, are in the RM/SM post-closure water-level monitoring network (Figure 2-3), and are measured annually and in the same quarter of each year, if possible. In CY 2022, water levels were measured in the wells and vent holes, or were calculated from the LTWLM PXDs. 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. The water levels are presented in Table 2-3.

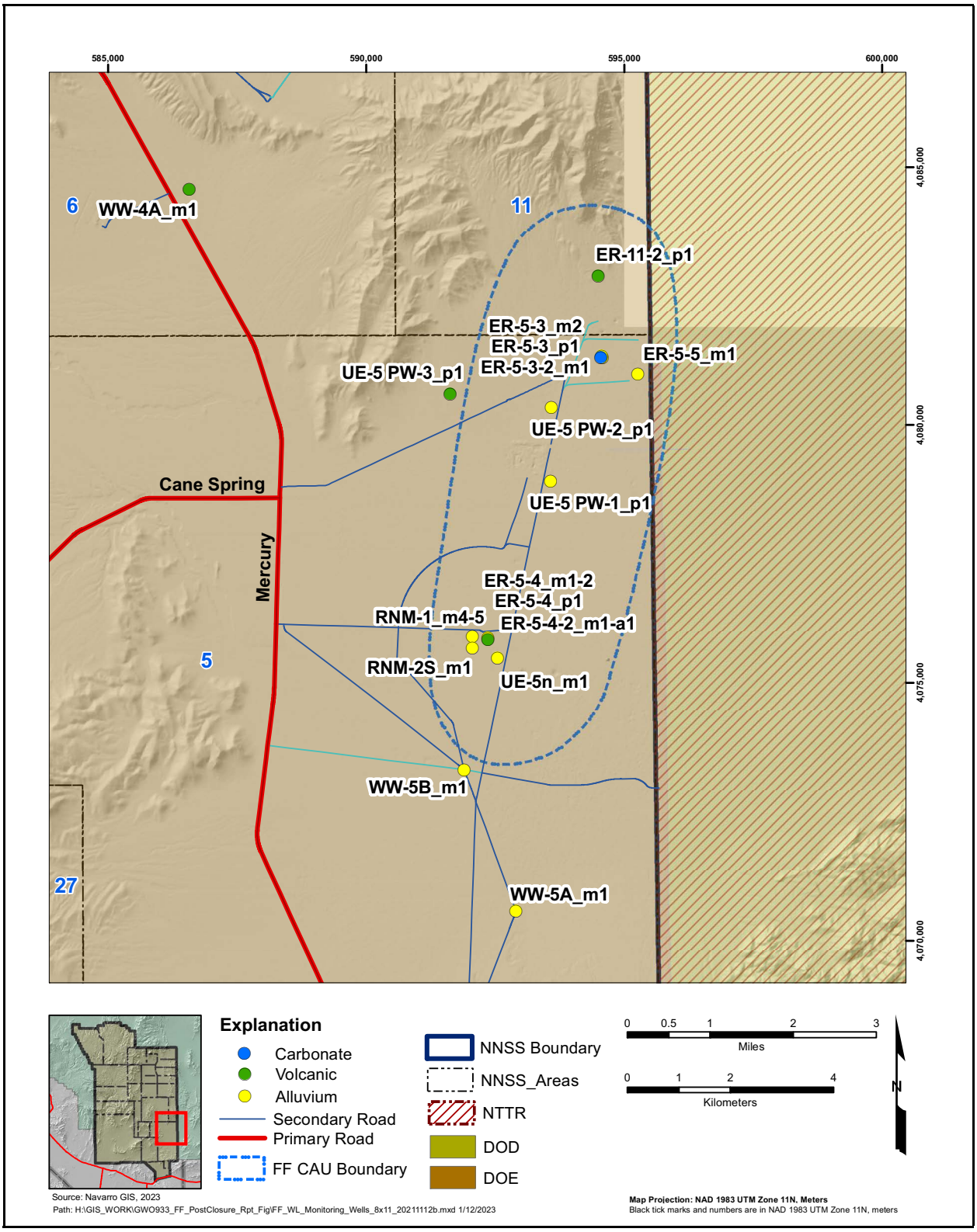

Figure 2-1
Water-Level Locations for the FF CAU

Table 2-1
CY 2022 FF Water-Level Measurements

Well and ISPID	Date	Depth to Water (ft bgs)
ER-5-3_p1	12/12/2022	928.22
ER-5-3_m2		927.58
ER-5-3-2_m1		961.30
ER-5-4_m1-2		725.92
ER-5-4_p1		725.65
ER-5-4-2_m1_a		649.38
ER-5-5_m1		930.26
ER-11-2_p1		1,153.97
RNM-1_m4-5		730.18 [a]
RNM-2s_m1		724.11
UE-5n_m1		706.70
WW-5A_m1		702.16
UE-5 PW-1_p1		774.34 [b]
UE-5 PW-2_p1		842.14 [b]
UE-5 PW-3_p1		891.24 [b]
WW-4A_m1	12/16/2022	841.65
WW-5B_m1		689.76

[a] Water level corrected for borehole deviation.
[b] Water level shown is feet above top of casing.

bgs = Below ground surface
ft = Foot
ISPID = Integrated Sampling Plan Identifier

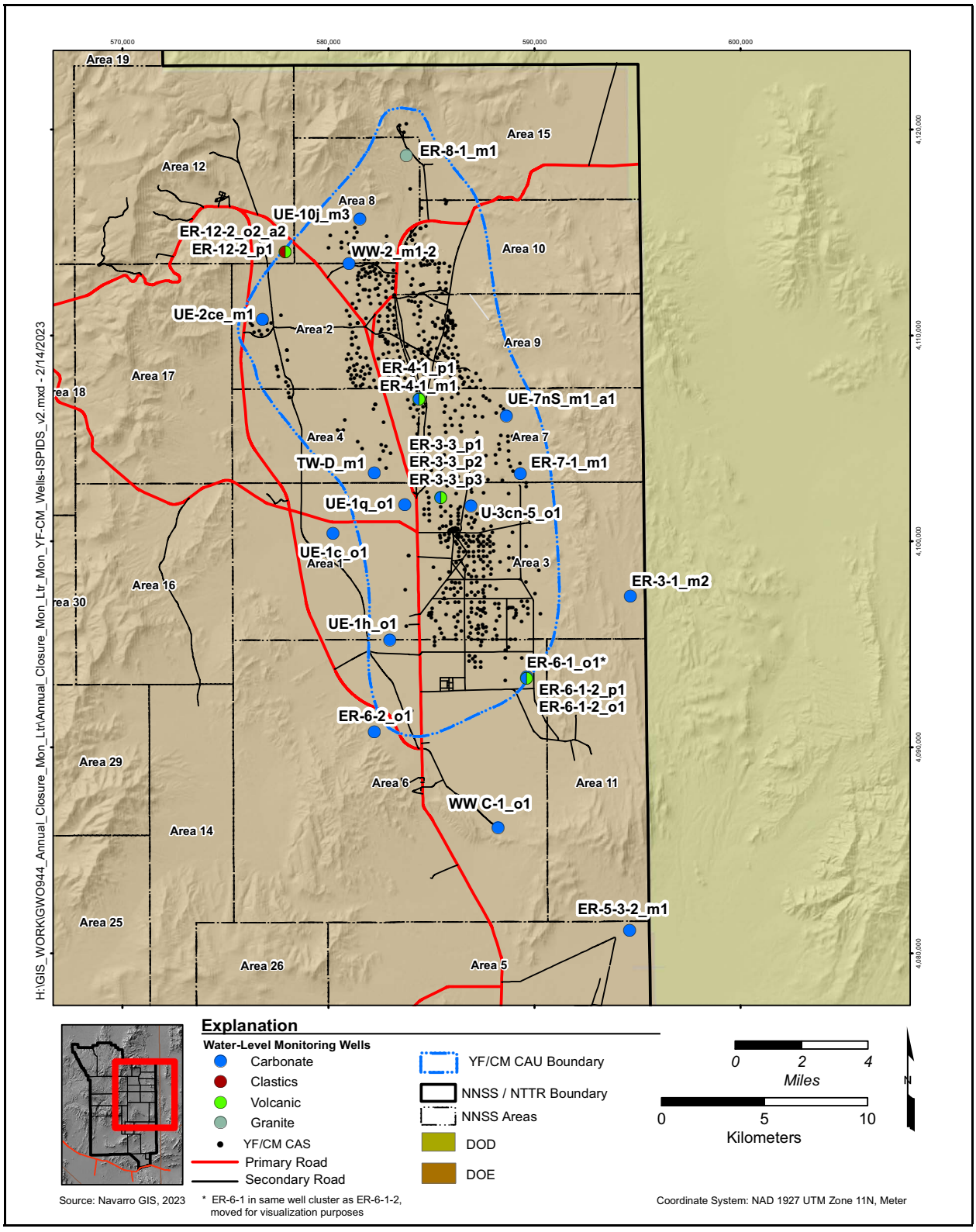

Figure 2-2
Water-Level Locations for the YF/CM CAU

Table 2-2
CY 2022 YF/CM Water-Level Measurements

Well and ISPID	Date	Depth to Water (ft bgs)
WW-2_m1-2	11/17/2022	2,052.00 [a]
ER-3-1_m2	09/20/2022	2,014.19
ER-6-1-2_o1	10/19/2022	1,544.28
ER-6-1-2_p1	10/19/2022	1,473.11
ER-7-1_m1	10/19/2022	1,852.33
U-3cn-5_o1	10/19/2022	1,619.07 [a]
UE-7nS_m1_a1	10/19/2022	1,968.57
ER-3-3_p1	10/19/2022	1,652.64
ER-3-3_p3	10/19/2022	1,468.26
ER-3-3_p2	11/01/2022	1,652.83 [b]
ER-6-1_o1	11/01/2022	1,545.92 [b]
UE-10j_m3	11/01/2022	2,158.90 [b]
WW C-1_o1	11/01/2022	1,543.17 [b]
UE-1c_o1	11/16/2022	1,297.41
UE-1q_o1	11/16/2022	1,655.05
ER-12-2_o2_a2	11/17/2022	174.77
ER-12-2_p1	11/17/2022	443.55
UE-1h_o1	11/17/2022	1,551.24
UE-2ce_m1	11/17/2022	1,457.00
ER-4-1_m1	11/21/2022	1,768.78
ER-4-1_p1	11/21/2022	1,007.44
TW-D_m1	11/21/2022	1,722.34
ER-6-2_o1	11/22/2022	1,779.57 [a]
ER-8-1_m1	11/28/2022	2,292.23
ER-5-3-2_m1	12/12/2022	961.30

[a] Water level corrected for borehole deviation.
[b] Water level was calculated from LTWLM PXD data.

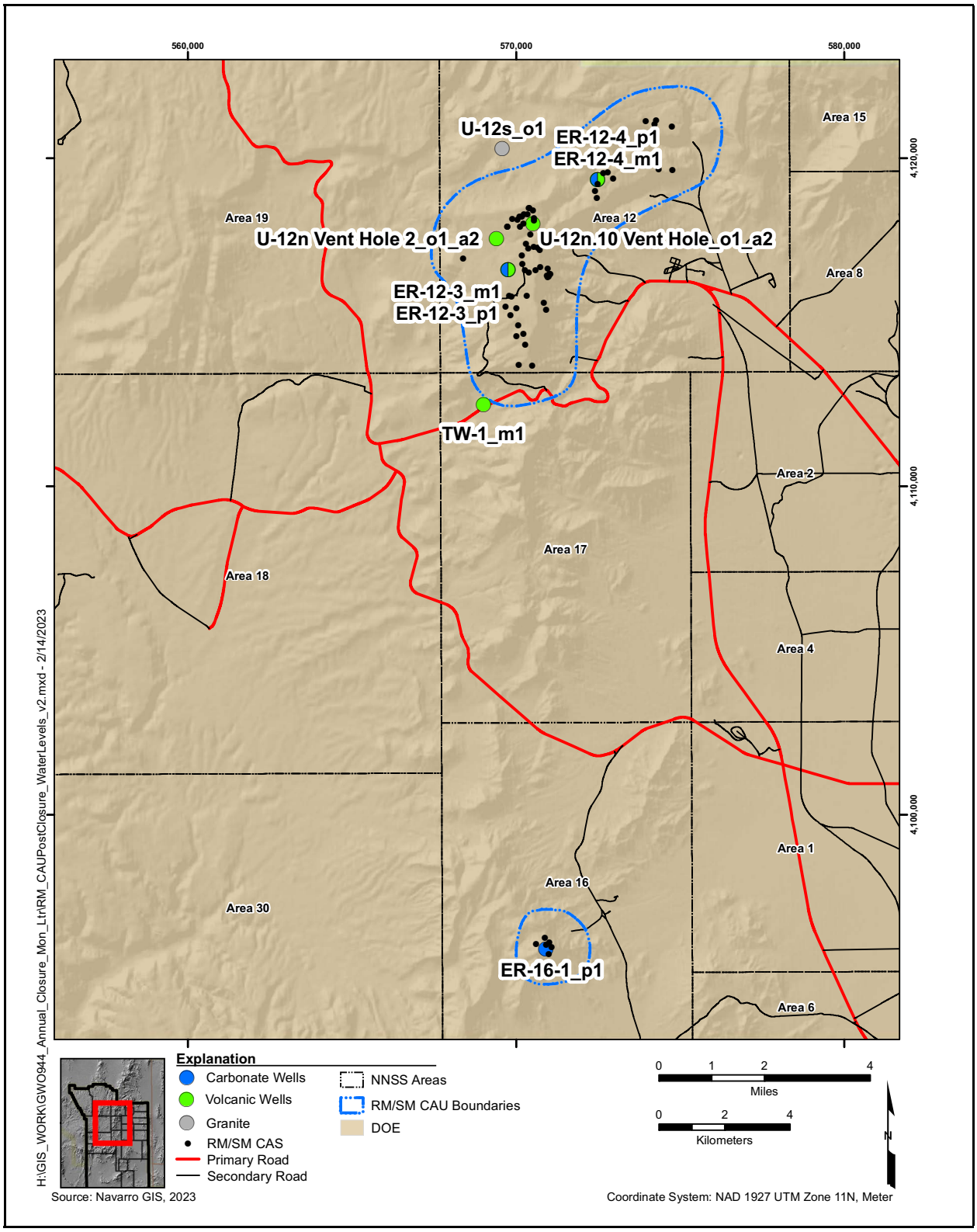

Figure 2-3
Water-Level Locations for the RM/SM CAU

Table 2-3
CY 2022 RM/SM Water-Level Measurements

Well and ISPID	Date	Depth to Water (ft bgs)
ER-16-1_p1	07/13/2022	4,084.68 [a]
U-12n.10 Vent Hole_o1_a2	10/15/2022	1,168.15 [b]
U-12n Vent Hole 2_o1_a2	10/15/2022	1,210.78 [b]
ER-12-3_m1	10/20/2022	3,111.87
TW-1_m1	10/20/2022	1,459.24
ER-12-4_m1	10/20/2022	2,566.17
ER-12-4_p1	10/20/2022	952.56
ER-12-3_p1	10/30/2022	1,242.11 [b]
U-12s_o1	11/03/2022	913.18

[a] Water level corrected for borehole deviation.
[b] Water level was calculated from LTWLM PXD data.

3.0 Well Site Surveillance

Sampling and water-level measurement wells/locations in the post-closure monitoring networks are maintained to correct deficiencies such as erosion around wellheads and to ensure well security. Any condition that affects the serviceability of a well will be noted in the field logbook and reported for corrective action. 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. 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:

- The infiltration area remains viable.
- Any new roads or facilities have been constructed.
- There have been changes to the drainage pattern or area.

3.1 CAU 98, Frenchman Flat

There are six sampling locations and 17 water-level locations in the FF post-closure monitoring network. The general road conditions, well pad conditions, infiltration areas, and surrounding areas were evaluated. The well pads are in good condition with no damage around the wellheads.

3.2 CAU 97, Yucca Flat/Climax Mine

There are 10 sampling locations and 25 water-level locations in the YF/CM post-closure monitoring network. The general road conditions, well pad conditions, infiltration areas, and surrounding areas were evaluated. The well pads are in good condition with no damage around the wellheads.

3.3 CAU 99, Rainier Mesa/Shoshone Mountain

There are 14 sampling locations and nine water-level locations in the RM/SM post-closure monitoring network. The general road conditions, well pad conditions, infiltration areas, and surrounding areas were evaluated. The well pads are in good condition with no damage around the wellheads.

4.0 Institutional Controls

4.1 CAU 98, Frenchman Flat

4.1.1 Use Restrictions

The URs for the FF CAU were recorded in the *Federal Facility Agreement and Consent Order* (FFACO) Database in 2016. The initial registration of the UR boundaries in the management and operating (M&O) Geographic Information Systems (GIS) was confirmed by letter in 2016. The continued registration and visibility of the URs were confirmed in January 2023 in the Integrated Planning Map maintained by the M&O contractor for the NNSS. The system shows two UR areas with accompanying descriptions and links to original documentation.

The initial U.S. Air Force (USAF) registry of the URs was asserted by letter from USAF in 2017. The continued presence of the URs was confirmed by letter from USAF in 2023.

4.1.2 Real Estate/Operations Permit

The Real Estate/Operations Permit (REOP) Risk and Hazard Questionnaire was revised in July 2022. The numbers were changed, but the questions remained the same.

REOP question 9.F, “Will the proposed scope of work require 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 positive answers.

REOP Risk and Hazard Questionnaire 9.G, “Will the proposed scope of work require 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 not have positive answers.

USAF confirmed by letter in 2023 that no new water wells were drilled or were in the planning stages during CY 2022, and that no USAF activities or facilities were proposed that could cause an increase in groundwater usage in the FF region during CY 2022.

4.1.3 Water Usage on the NNSS and Surrounding Basin

On the NNSS, the active production/water-supply wells in the FF hydrographic basin are WW-4, WW-4A, WW-5B, and WW-5C. Water production for CY 2022 from WW-4 was 40,880,300 gallons (gal); production from WW-4A was 22,511,400 gal; production from WW-5B was 44,420,800 gal; and production from WW-5C was 59,900 gal.

A query was sent in January 2023 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. The answer was negative for the reporting period.

A search on the NDWR website for hydrographic basin summaries by manner of use was conducted for Amargosa Desert, Indian Springs Valley, Frenchman Flat, and Three Lakes Valley. This search of groundwater resources in these basins surrounding FF identified commercial, irrigation, mining, municipal, domestic, and wildlife use of the groundwater.

4.2 CAU 97, Yucca Flat/Climax Mine

4.2.1 Use Restrictions

The institutional controls established through the YF/CM CR and its ensuing record of technical change (ROTC) are restrictions that apply within the UR area and upgradient of the regulatory boundary negotiated between the Environmental Management (EM) Nevada Program and NDEP. The initial registration of the UR boundaries in the M&O GIS was confirmed by letter in May 2021. The URs were recorded in the FFACO Database in March 2022 and verified in January 2023.

4.2.2 Real Estate/Operations Permit

REOP Risk and Hazard Questionnaire question 9.F, “Will the proposed scope of work require 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 positive answers.

REOP Risk and Hazard Questionnaire 9.G, "Will the proposed scope of work require 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 not have positive answers.

4.2.3 Water Usage on the NNSS and Surrounding Basins

On the NNSS, the only active production/water-supply well in the YF hydrographic basin is Water Well UE-16d (also known as UE-16d WW). In CY 2022, Water Well UE-16d had a production of 29,711,800 gal due to the increased usage of the Area 1 Batch Plant.

Based on the REOP reviews during the CY 2022 period, there have not been and there are no current plans for activities that would increase the water usage or have any impact on the YF hydrographic basin.

A query was sent in January 2023 to the 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. The answer was negative for the reporting period.

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, Gold Flat Basin, and Yucca Flat. This search of groundwater resources in these basins surrounding YF identified commercial, domestic, irrigation, municipal, and stockwater use of the groundwater.

4.3 CAU 99, Rainier Mesa/Shoshone Mountain

4.3.1 Use Restrictions

The institutional controls established through the RM/SM CR 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 initial registration of the UR boundaries in

the M&O GIS was confirmed by letter in May 2021. The URs were recorded in the FFACO Database in March 2022 and verified in January 2023.

4.3.2 Real Estate/Operations Permit

REOP Risk and Hazard Questionnaire question 9.F, "Will the proposed scope of work require 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 positive answers.

REOP Risk and Hazard Questionnaire 9.G, "Will the proposed scope of work require 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 not have positive answers.

4.3.3 Water Usage on the NNSS and Surrounding Basin

On the NNSS, there are no active production/water supply wells in the RM/SM CAU.

A query was sent in January 2023 to the 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. The answer was negative for the reporting period.

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. This search of groundwater resources in these basins surrounding RM/SM identified industrial, mining, municipal, commercial, irrigation, recreation, and stockwater use of the groundwater.

5.0 Triggers

5.1 Triggers for CAU 98, Frenchman Flat

Triggers have been established for the FF CAU monitoring network after NDEP approval of the FF five-year evaluation report. The FF CAU monitoring network has a trigger of 1,000-picocuries per liter (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) maximum contaminant level (MCL) of 20,000 pCi/L. The wells within the FF CAU network will be sampled every six years only for ^{3}H until the trigger is reached or exceeded. If the 1,000-pCi/L ^{3}H trigger is reached or exceeded, iodine-129 (^{129}I) and carbon-14 (^{14}C) will be added to the sampling requirements for the location that exceeded the trigger point for all subsequent samplings.

In addition to the FF CAU monitoring network trigger, there are three additional triggers listed in the CR that were not reached in CY 2022:

- 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.

5.2 Triggers for CAU 97, Yucca Flat/Climax Mine

The YF/CM CAU monitoring network has a trigger of 1,000-pCi/L measurement of ^{3}H. This trigger is 5 percent of the EPA SDWA MCL of 20,000 pCi/L. The wells within the YF/CM CAU network will be sampled every six years 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.

No wells were sampled in the YF/CM CAU during CY 2022, except for WW C-1 (see Section 6.1).

In addition to the YF/CM CAU monitoring network trigger, there are three additional triggers listed in the CR that were not reached in CY 2022:

- 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.

5.3 Triggers for CAU 99, Rainier Mesa/Shoshone Mountain

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 EPA SDWA MCL of 20,000 pCi/L. The wells and vent holes within the network are sampled every six years 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.

No wells were sampled in the RM/SM CAU during CY 2022.

In addition to the RM/SM CAU monitoring network trigger, there are three additional triggers listed in the CR that were not reached in CY 2022:

- 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 Special Studies

6.1 YF/CM Well WW C-1

In accordance with the YF/CM CR and its ensuing ROTC, WW C-1 in this CAU will be sampled for low-level ^{3}H annually for six years beginning in 2020.

A low-level ^{3}H sample and a field duplicate sample were collected while the well was being pumped on May 25, 2022.

The low-level ^{3}H results were above the minimum detectable concentrations (MDCs) at 51.54 pCi/L and 48.76 pCi/L for the sample and field duplicate, respectively. The reported low-level ^{3}H values are larger than values reported in CY 2021, and some of the laboratory quality control (QC) sample results were outside of required control limits. This prompted a request to the laboratory to reprocess and reanalyze the remaining sample stored at their site. The original and reanalyzed results are shown in Table 6-1. The low-level ^{3}H values reported for WW C-1 have been designated with a "J" qualifier because some of the laboratory QC sample results were outside of required control limits for both the original and reanalyzed samples.

Table 6-1
CYs 2020–2022 WW C-1_o1 Low-Level ^{3}H Sampling Results

Well and ISPID	Sample Date	Low-Level ^{3}H (pCi/L)	MDC (pCi/L)
WW C-1_o1	06/18/2020	9.91 | 12.49	2.55 | 2.77
	11/30/2021	10.67 | 11.04	2.71 | 2.71
	05/25/2022	J 51.54 | J 48.76	2.69 | 2.32
		J 50.03 [a] | J 53.67 [a]	3.07 [a] | 2.64 [a]

[a] Sample was re-analyzed.

J = Result is estimated.

Note:
(1) The symbol "|" reports the sample and duplicate results.

Source: UGTA Chemistry Database.

An analysis of the six years of low-level ^{3}H results will be documented in the YF/CM six-year post-closure monitoring report.

7.0 Summary

The CY 2022 post-closure monitoring activities were conducted at the FF, YF/CM, and RM/SM CAUs as indicated in the CAU-specific CRs:

- Water levels were measured in specified wells.
- Well site surveillance was conducted at specified well sites. At the inspected well sites, the well pads are in good condition with no damage around the wellheads.
- Sampling for low-level ^{3}H was conducted at the YF/CM Well WW C-1. The low-level ^{3}H results were above the MDCs at 51.54 pCi/L and 48.76 pCi/L for the sample and field duplicate, respectively. The reported low-level ^{3}H values are larger than values reported in CY 2021, and some of the laboratory QC sample results were outside of required control limits. This prompted a request to the laboratory to reprocess and reanalyze the remaining sample stored at their site. The original and reanalyzed results are shown in Table 6-1. The low-level ^{3}H values reported for WW C-1 have been designated with a "J" qualifier because some of the laboratory QC sample results were outside of required control limits for both the original and reanalyzed samples.
- URs and institutional controls were verified. All URs at the CAUs were verified as being in place to limit access to the area within the UR boundaries.
- Water usage was determined and verified on the NNSS and surrounding hydrographic basins for the CAUs by the M&O contractor and NDWR personnel.
- Any triggers reached at the FF, YF/CM, and RM/SM CAUs were identified:
  - At FF, no wells were sampled. No triggers listed in the FF five-year evaluation have been reached in CY 2022.
  - At YF/CM, no wells were sampled except WW C-1 (Section 6.1). No triggers listed in the CR have been reached in CY 2022.
  - At RM/SM, no wells were sampled. No triggers listed in the CR have been reached in CY 2022.

Appendix A

Nevada Division of Environmental Protection Comments

(1 Page)

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Final Calendar Year (CY) 2022 Post-Closure Monitoring Letter Report, Revision 0, March 2023 (Letter Report)	2. Document Date: March 2023
3. Revision Number: 0	4. Originator/Organization: Navarro
5. Responsible EM Nevada Program Activity Lead: John Myers	6. Date Comments Due: April 2023
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Christine Andres (702) 668-3911; Meghan Lyle (702) 668-3024	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
1.	Section 6.1, Page 17 and Section 7.0, Page 18		Please confirm that the requested reanalysis results of the samples from Well WW C-1 also had laboratory QC sample results that were outside of required control limits when analyzed.	It was confirmed that the requested reanalysis results also had laboratory QC sample results outside the required control limits. Revised sentence to read "The low-level ^{3}H values reported for WW C-1 … required control limits for both the original and reanalyzed samples."
2.	Section 6.1, Page 17, Table 6-1		Given that there was an approximate fivefold increase in low-level ^{3}H results in WW C-1 from CY 2021, there should be a cumulative table presented in each subsequent Annual Letter Report without waiting for the six-year post-closure monitoring report to include such a table.	Revised Table 6-1 to show results from CYs 2020, 2021, and 2022. Subsequent letter reports will include all results.

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