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Annual Periodic Monitoring Report for the General Surveillance Monitoring Group, Revision 1

N3B Los Alamos

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EXECUTIVE SUMMARY

This annual periodic monitoring report (PMR) presents results for the General Surveillance monitoring group of the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) groundwater monitoring program that have not been previously reported. All monitoring work reported in this PMR was conducted pursuant to the "Interim Facility-Wide Groundwater Monitoring Plan for the 2017 Monitoring Year, October 2016–September 2017" and the "Interim Facility-Wide Groundwater Monitoring Plan for the 2018 Monitoring Year, October 2017–September 2018," both prepared in accordance with the Compliance Order on Consent. The revision includes exceedances from monitoring location Mortandad at Rio Grande that were incorrectly calculated and left out of the original report. Additionally, the revision includes results in Appendix C from the June 19, 2018, event at LLAO-4.

This PMR presents monitoring results for ten periodic monitoring events (PMEs) conducted during the fourth quarter of monitoring year 2017 (MY 2017) and the first, second, and third quarters of MY 2018, and includes the monitoring of surface-water, groundwater spring, and groundwater well or well screen locations. Two of the PMEs were conducted in the Los Alamos and Pueblo watershed portion of the General Surveillance monitoring group, three in the Mortandad and Sandia watershed portion, two in the Water Canyon/Cañon de Valle portion, one in the White Rock Canyon and Rio Grande portion, and two in the Pajarito portion. This PMR also includes any results from earlier general surveillance PMEs conducted in these watersheds that have not yet been reported because validated laboratory data were not available (in some cases because of data release agreements).

Surface-water and groundwater samples collected during the PMEs were analyzed for metals; volatile organic compounds; semivolatile organic compounds; polychlorinated biphenyls; dioxins and furans; high explosives; radionuclides, including low-level tritium; general inorganic chemicals, including perchlorate; and field parameters (dissolved oxygen, oxidation-reduction potential, pH, specific conductance, temperature, and turbidity).

Three~~One~~ surface-water analytical results reported in this PMR ~~was~~ were above applicable screening values. Eight groundwater analytical results reported in this PMR were above applicable screening values.

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Acronyms and Abbreviations

AOC	area of concern
BCG	Biota Concentration Guide (DOE)
CFR	Code of Federal Regulations (U.S.)
Consent Order	Compliance Order on Consent
DCS	Derived Concentration Technical Standard (DOE)
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
F	filtered
gpm	gallons per minute
HE	high explosives
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IFGMP	Interim Facility-Wide Groundwater Monitoring Plan
LANL	Los Alamos National Laboratory
MCL	maximum contaminant level (EPA)
MDA	material disposal area
MDL	method detection limit
MY	monitoring year
N	no (best value flag code)
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
NM	not measured
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NM HH OO	NMWQCC human-health organism only, surface water quality standard
NMWQCC	New Mexico Water Quality Control Commission
NTU	nephelometric turbidity unit
PCB	polychlorinated biphenyl
PME	periodic monitoring event

PMR	periodic monitoring report
QC	quality control
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RFI	RCRA facility investigation
RLWTF	Radioactive Liquid Waste Treatment Facility
SU	standard unit
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TDS	total dissolved solids
TNT	2,4,6-trinitrotoluene
UF	unfiltered
VOC	volatile organic compound
Y	yes (best value flag code)

1.0 INTRODUCTION

This Annual Periodic Monitoring Report for the General Surveillance monitoring group (hereafter, the annual PMR) provides documentation of the following surface-water and groundwater periodic monitoring events (PMEs) conducted by Los Alamos National Laboratory (LANL or the Laboratory) or Newport News Nuclear BWXT-Los Alamos, LLC (N3B). (During the third quarter of fiscal year 2018, environmental remediation work transitioned from the Laboratory, under the U.S. Department of Energy [DOE] National Nuclear Security Administration, to N3B under the DOE Office of Environmental Management.)

Watershed Portion of the General Surveillance Monitoring Group	PMEs Reported in this PMR		PME Field Sampling	
	MY[a]	Quarter	Begin	End
Los Alamos/Pueblo	2018	1	12/12/17	12/13/17
		3	06/12/18	06/26/18
Mortandad/Sandia	2017	4	07/27/17	08/09/17
	2018	1	11/15/17	11/28/17
		3	05/15/18	05/15/18
Pajarito	2018	1	11/01/17	11/01/17
		3	04/10/18	04/19/18
Water Canyon/Cañon de Valle	2017	4	n/a[b]	n/a
	2018	2	n/a	n/a
White Rock Canyon/Rio Grande	2018	1	10/03/17	10/12/17

[a] MY = Monitoring year.

[b] n/a = Not applicable; no samples were collected during this PME.

The annual PMR for the General Surveillance monitoring group is submitted to the New Mexico Environment Department (NMED) every November and includes monitoring group PMEs performed through the third quarter of the monitoring year (MY). This PMR presents monitoring results for ten PMEs conducted during the fourth quarter of MY 2017 and the first, second, and third quarters of MY 2018.

Monitoring was conducted pursuant to the “Interim Facility-Wide Groundwater Monitoring Plan for the 2017 Monitoring Year, October 2016–September 2017” (2017 IFGMP) (LANL 2016, 601506) and the “Interim Facility-Wide Groundwater Monitoring Plan for the 2018 Monitoring Year, October 2017–September 2018” (2018 IFGMP) (LANL 2017, 602406), both prepared in accordance with the Compliance Order on Consent (Consent Order). The PMEs noted above included sampling of surface water, groundwater spring, and groundwater well (or well screen) locations. The revision includes exceedances from monitoring location Mortandad at Rio Grande that were incorrectly calculated and left out of the original report. Additionally, the revision includes results in Appendix C from the June 19, 2018, event at LLAO-4.

This report also includes any results from previous General Surveillance monitoring group PMEs that were unreported in their respective PMRs because validated laboratory data were not available (in some cases because of data release agreements). Additional results from sampling that occurred outside the time frame of a PME are also included in this report.

Section IX of the Consent Order describes the role of data screening in the corrective action process. Screening values are used to identify the *potential* for unacceptable risk resulting from the presence of contaminants in groundwater and surface water. New Mexico Water Quality Control Commission (NMWQCC) groundwater standards, U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs), NMED screening levels for tap water, and EPA regional screening levels for tap water are used to establish a set of screening values for evaluating IFGMP monitoring data. If contaminants are present at concentrations above screening values, additional risk evaluation is required to determine the potential need for cleanup (corrective action).

This report presents the following information:

- general background information on the monitoring group
- field-measurement monitoring results
- water-quality monitoring results
- screening analysis results
- a summary based on the monitoring data and the results of screening analysis

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 Background

Most of the monitoring locations discussed in the 2017 IFGMP (LANL 2016, 601506) and 2018 IFGMP (LANL 2017, 602406) are assigned to area-specific monitoring groups related to project areas that may be located in more than one watershed. Locations not included within one of these six area-specific monitoring groups are assigned to the General Surveillance monitoring group. This annual PMR presents monitoring results for the Los Alamos/Pueblo, Mortandad/Sandia, Pajarito, Water Canyon/Cañon de Valle, and White Rock Canyon/Rio Grande watershed portions of the General Surveillance monitoring group.

Los Alamos and Pueblo Watersheds

Monitoring locations in Los Alamos and Pueblo Canyons other than locations in the General Surveillance monitoring group are assigned to the Technical Area 21 (TA-21) monitoring group. The TA-21 monitoring group is located in and around TA-21 and is primarily located in upper Los Alamos Canyon. TA-21 is located on the mesa north of Los Alamos Canyon, which is joined by DP Canyon, east of TA-21. TA-21 consists of two past operational areas, DP West and DP East, both of which produced liquid and solid radioactive wastes. The operations at DP West included plutonium processing, while the operations at DP East included the production of weapons initiators and tritium research.

From 1952 to 1986, a liquid-waste treatment plant discharged effluent containing radionuclides from the former plutonium-processing facility at TA-21 into DP Canyon. Primary sources of contaminants in the vicinity of the TA-21 monitoring group include the effluent outfall [Solid Waste Management Unit (SWMU) 21-011(k)], the adsorption beds and disposal shafts at Material Disposal Area (MDA) T, DP West, and waste lines and sumps. Other potential sources include DP East and leakage from an underground diesel fuel line. The monitoring objectives for the TA-21 monitoring group are based in part on the results and conclusions presented in the “Los Alamos and Pueblo Canyons Investigation Report” (LANL 2004, 087390) as well as on the NMED-approved “Los Alamos and Pueblo Canyons Groundwater Monitoring Well Network Evaluation and Recommendations, Revision 1” (LANL 2008, 101330).

Los Alamos Canyon received releases of radioactive effluents during the earliest Manhattan Project operations at TA-01 (1942–1945) and until 1993 from nuclear reactors at TA-02. Los Alamos Canyon also received radionuclides and metals in discharges from the sanitary sewage lagoons and cooling towers at the Los Alamos Neutron Science Center at TA-53. Except for strontium-90, contaminant concentrations in shallow groundwater have decreased dramatically in recent decades.

Pueblo Canyon receives effluent from the new Los Alamos County Wastewater Treatment Plant (completed in 2007). Acid Canyon, a tributary, received radioactive industrial effluent from 1943 to 1964. Compared with past decades, little radioactivity is detected in current groundwater samples.

Mortandad and Sandia Watersheds

Monitoring locations in Mortandad and Sandia Canyons, other than locations in the General Surveillance monitoring group, are assigned to the Chromium Investigation monitoring group, which is located in Mortandad and Sandia Canyons, and the Material Disposal Area C (MDA C) monitoring group, located in Mortandad Canyon. Monitoring for the Chromium Investigation monitoring group focuses on the characterization and fate and transport of chromium contamination in intermediate-perched groundwater and within the regional aquifer. The distribution of groundwater monitoring wells in the monitoring group also addresses historical releases from Outfall 051, which discharges from the Radioactive Liquid Waste Treatment Facility (RLWTF) in the Mortandad Canyon watershed. Effluent discharge was suspended in 2011 because of process changes at the RLWTF. Monitoring for the MDA C monitoring group focuses on detecting potential releases from inactive waste disposal units at MDA C.

Sandia Canyon heads on Laboratory property within TA-03 at an elevation of approximately 7300 ft and trends east-southeast across the Laboratory, Bandelier National Monument, and Pueblo de San Ildefonso (also referred to as San Ildefonso Pueblo). Sandia Canyon empties into the Rio Grande in White Rock Canyon at an elevation of 5450 ft. The area of the Sandia Canyon watershed is approximately 5.5 mi^2. Perennial stream flow and saturated alluvial groundwater conditions occur in the upper and middle portions of the canyon system because sanitary wastewater and cooling-tower effluent discharge to the canyon from operating facilities. A wetland of approximately 7 acres has developed as a result of the effluent discharge. The only known perennial spring in the watershed (Sandia Spring) is located in lower Sandia Canyon near the Rio Grande. Technical areas located in the Sandia Canyon watershed include TA-03, TA-53, TA-60, TA-61, TA-72, and former TA-20. A total of 264 SWMUs and areas of concern (AOCs) are located within the portions of these technical areas in the Sandia Canyon watershed.

Mortandad Canyon is an east-to-southeast trending canyon that heads on the Pajarito Plateau near the main Laboratory complex at TA-03 at an elevation of 7380 ft. The drainage extends about 9.6 mi from its headwaters to its confluence with the Rio Grande at an elevation of 5440 ft. The canyon crosses San Ildefonso Pueblo land for several miles before joining the Rio Grande (LANL 1997, 056835). The Mortandad Canyon watershed is located in the central portion of the Laboratory and covers approximately 10 mi^2. The Mortandad Canyon watershed contains several tributary canyons that have received contaminants released during Laboratory operations, including Ten Site Canyon, Pratt Canyon, Effluent Canyon, and Cañada del Buey. Technical areas located in the Mortandad Canyon watershed include TA-03, TA-05, TA-35, TA-48, TA-50, TA-52, TA-55, TA-60, TA-63, former TA-04, and former TA-42. A total of 257 SWMUs and AOCs are located within the portions of these technical areas in the Mortandad Canyon watershed.

Chromium concentrations exceed the NMED groundwater standard in Mortandad Canyon regional aquifer groundwater monitoring wells R-28, R-62, R-42, R-43, and R-50. Other constituents detected above background in groundwater monitoring wells in the monitoring group include nitrate, perchlorate, and tritium. A conceptual model for the sources and distribution of these contaminants is presented in the “Investigation Report for Sandia Canyon” (LANL 2009, 107453) and the “Phase II Investigation Report for Sandia Canyon” (LANL 2012, 228624).

The conceptual model hypothesizes that chromium and other contaminants originate from releases into Sandia Canyon with lateral migration pathways that move contamination to locations beneath Mortandad Canyon. For this reason, intermediate-perched and regional groundwater monitoring wells beneath Mortandad Canyon are included in the Chromium Investigation monitoring group. Other areas of contamination beneath Sandia and Mortandad Canyons may be associated with Mortandad Canyon sources. These sources and the migration pathways are described in the "Investigation Report for Sandia Canyon" (LANL 2009, 107453) and the "Phase II Investigation Report for Sandia Canyon" (LANL 2012, 228624).

MDA C, located on Mesita del Buey in TA-50, at the head of Ten Site Canyon, is an inactive 11.8-acre landfill consisting of 7 disposal pits and 108 shafts. Solid low-level radioactive wastes and chemical wastes were disposed of in the landfill between 1948 and 1974. The depths of the 7 pits at MDA C range from 12 ft to 25 ft below the original ground surface. The depths of the 108 shafts range from 10 ft to 25 ft below the original ground surface. The original ground surface is defined as beneath the cover that was placed over the site in 1984. The pits and shafts are constructed in the Tshirege Member of the Bandelier Tuff. The regional aquifer is estimated to be approximately 1330 ft deep based on the water level in well R-46 (LANL 2009, 105592). The topography of MDA C is relatively flat, although the slope steepens to the north where the northeast corner of MDA C abuts the south wall of Ten Site Canyon.

Vapor-phase volatile organic compounds (VOCs) and tritium are present in the upper 500 ft of the unsaturated zone beneath MDA C (LANL 2011, 204370). The primary vapor-phase contaminants beneath MDA C are trichloroethene and tritium. There is no evidence of groundwater contamination in the regional aquifer. MDA C is located on a mesa top above thick, unsaturated units of the Bandelier Tuff; therefore, present-day aqueous-phase transport is generally believed to be minimal.

Pajarito Canyon Watershed

Monitoring locations in Pajarito Canyon, other than locations in the General Surveillance monitoring group, are assigned to the TA-54 Investigation monitoring group, which is located predominantly in Pajarito Canyon. At TA-54, groundwater monitoring is conducted to support both (1) the corrective measures process for SWMUs and AOCs (particularly MDAs G, H, and L) under the Consent Order and (2) the Resource Conservation and Recovery Act (RCRA) permit. The TA-54 monitoring group was established to address the monitoring requirements for all portions and aspects of TA-54. The TA-54 monitoring group includes both intermediate-perched and regional groundwater monitoring wells in the near vicinity. Other downgradient groundwater monitoring wells have general relevance to TA-54 and other upgradient sources but are not considered part of the TA-54 monitoring network and are not included in the monitoring group.

Pajarito Canyon has a drainage that extends into the Sierra de los Valles, west of the Laboratory. Saturated alluvium occurs in lower Pajarito Canyon near the eastern Laboratory boundary but does not extend beyond the boundary. In the past, the Laboratory released small amounts of wastewater into tributaries of Pajarito Canyon from several high-explosives– (HE-) processing sites at TA-09 and a plating facility at TA-22. Some firing sites border portions of tributaries Twomile and Threemile Canyons. A nuclear materials experimental facility occupied the floor of Pajarito Canyon at TA-18. Waste management areas at TA-54, used for disposal of organic chemicals and low-level radioactive waste, occupy the mesa north of the lower part of the canyon. A small contaminated area of shallow intermediate groundwater occurs behind a former Laboratory warehouse location at TA-03. The main groundwater impacts are from organic chemicals and from HE. The occurrence of surface water, alluvial groundwater, and intermediate-perched and regional groundwater is discussed in the Pajarito Canyon Investigation Report, Revision 1 (LANL 2009, 106939).

TA-54 is situated in the east-central portion of the Laboratory on Mesita del Buey. TA-54 includes four MDAs designated as G, H, J, and L; a waste characterization, container storage, and transfer facility (TA-54 West); active radioactive waste storage and disposal operations at Area G; hazardous and mixed waste storage operations at Area L; and administrative and support areas. The transfer facility is located at the western end of TA-54. A total of 47 SWMUs and AOCs are located within TA-54.

Data from the groundwater monitoring network around TA-54 show sporadic detections of a variety of contaminants, including several VOCs. The temporal and spatial nature of the occurrences does not, however, clearly indicate the presence of a source related to potential sources at TA-54 (LANL 2009, 106939). Further evaluations of existing groundwater data near TA-54 and detailed descriptions of organic and inorganic contaminants detected in intermediate-perched and regional groundwater at TA-54 are presented in the corrective measures evaluation reports for MDAs G, H, and L (LANL 2011, 206324; LANL 2011, 206319; LANL 2011, 205756).

Water Canyon and Cañon de Valle Watersheds

Monitoring locations in Water Canyon and Cañon de Valle, other than locations in the General Surveillance monitoring group, are assigned to the TA-16 260 monitoring group. The TA-16 260 monitoring group was established for the upper Water Canyon/Cañon de Valle watershed to monitor contaminants released from Consolidated Unit 16-021(c)-99, which is the TA-16 260 Outfall (hereafter, the 260 Outfall), and other sites at TA-16. The 260 Outfall is a former HE-machining outfall that discharged HE-bearing water to Cañon de Valle from 1951 through 1996 and is the predominant source of contaminants detected in groundwater in the Water Canyon/Cañon de Valle area. These discharges contaminated soils, sediments, surface waters, spring waters, and intermediate-perched and regional groundwater at TA-16.

The TA-16 260 monitoring group includes base flow, springs, alluvial groundwater monitoring wells, and groundwater monitoring wells completed in several deeper intermediate-perched groundwater zones and in the regional aquifer. Shallow monitoring locations such as the springs and alluvial wells are included in this monitoring group because they contain HE, barium, and VOC contamination related to past activities at the 260 Outfall and other sites in the area.

TA-16 is located in the southwest corner of the Laboratory and was established to develop explosive formulations, cast and machine explosive charges, and assemble and test explosive components for the nuclear weapons program. TA-16 is bordered by Bandelier National Monument along NM 4 to the south and by the Santa Fe National Forest along NM 501 to the west. To the north and east, it is bordered by TA-08, TA-09, TA-11, TA-14, TA-15, TA-37, and TA-49. Water Canyon, which is 200 ft deep with steep walls, separates NM 4 from active sites at TA-16. Cañon de Valle forms the northern border of TA-16.

Discharges from the former 260 Outfall at Consolidated Unit 16-021(c)-99 from 1951 to 1996 served as a primary source of HE and inorganic contamination found throughout the site (LANL 1998, 059891; LANL 2003, 085531). Results of the 260 Outfall corrective measures evaluation (LANL 2007, 098734) show the drainage channel below the outfall and the canyon bottom, as well as surface water, alluvial groundwater, and intermediate-perched groundwater, are contaminated with explosive compounds, including RDX (Royal Demolition Explosive); HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine); TNT (2,4,6-trinitrotoluene); and barium. In addition, the VOCs tetrachloroethene and trichloroethene have been detected in springs, alluvial groundwater, and intermediate-perched groundwater.

White Rock Canyon and Rio Grande Watershed

The Rio Grande flows from northeast to southwest in the vicinity of the Laboratory and forms a part of the eastern Laboratory boundary. The White Rock Canyon springs are located along the Rio Grande at the eastern border of the Laboratory, in addition to Los Alamos County land and land belonging to Pueblo de San Ildefonso. The springs serve as monitoring points to detect possible discharges of contaminated groundwater from beneath the Laboratory into the Rio Grande. The White Rock springs are some of the most frequently monitored locations in or next to the Laboratory. Most of the major springs have been sampled regularly since the late 1960s, with some sampled since the early 1950s.

Tritium operations took place at TA-33. The RCRA facility investigation (RFI) work plan for Operable Unit 1122 (LANL 1992, 007671) describes environmental concerns at TA-33. A total of 60 SWMUs and AOCs are located within TA-33. To the north of TA-33 lies TA-70, a buffer area where no Laboratory activities have occurred. There are no SWMUs or AOCs within TA-70. Adjoining TA-70 to the north are low- to moderate-density residential areas in White Rock, a mix of private property, and Los Alamos County land. A municipal sanitary treatment plant discharges effluent into Mortandad Canyon just above the river at the northern county boundary. San Ildefonso Pueblo property borders Los Alamos County on the north; this land is undeveloped. San Ildefonso Pueblo operates numerous water-supply wells on both sides of the Rio Grande, and the City of Santa Fe operates the Buckman well field on the east side of the Rio Grande across from White Rock.

2.0 SCOPE OF ACTIVITIES

The PMEs for the General Surveillance monitoring group were conducted pursuant to the 2017 IFGMP (LANL 2016, 601506) and 2018 IFGMP (LANL 2017, 602406).

Table 2.0-1 provides the name, watershed, sample collection date, screened interval, top and bottom screen depths, casing volume, purge volume, and purge or flow rate for each of the planned monitoring locations. These locations are shown Plates 1 through 5, which are the location maps for the Los Alamos/Pueblo, Mortandad/Sandia, Pajarito, Water Canyon/Cañon de Valle, and White Rock Canyon/Rio Grande watershed portions of the General Surveillance monitoring group, respectively.

3.0 REGULATORY CRITERIA

Regulatory criteria related to groundwater quality form the basis for the screening values to which groundwater monitoring results are compared in this PMR. These criteria include the NMWQCC groundwater standards, EPA MCLs, NMED screening levels for tap water, and EPA regional screening levels for tap water. These criteria are used to screen results in accordance with the process specified in Section IX of the Consent Order as listed in Table 3.0-1. This screening process is described in more detail in section 5.2.

4.0 MONITORING RESULTS

4.1 Methods and Procedures

All methods and procedures used to perform the field activities associated with the data reported in this PMR are documented in the 2017 IFGMP (LANL 2016, 601506) and 2018 IFGMP (LANL 2017, 602406).

4.2 Field Parameter Results

Appendix A presents the field parameter measurements associated with the sampling and analysis data that are reported in this PMR.

4.3 Groundwater Elevations and Base-Flow Observations

The groundwater level is measured at each groundwater monitoring location before purging and sampling that location as required by the Consent Order. Section 4.4 notes any instances where this requirement could not be met.

While groundwater-level data is collected before purging and sampling, for most monitoring locations, groundwater-level data is also collected "continuously" (e.g., hourly, daily), and these data are voluntarily presented in this PMR. Any gaps in the continuous groundwater-level records presented in this PMR are a result of one or more of the following conditions:

- Dry well
- Well not equipped with a pressure (level) transducer
- Water level below transducer
- Transducer not functioning properly (including failure)
- Transducer temporarily removed from well for maintenance and/or calibration

Groundwater-level data for the previous 2 yr are presented in Appendix B (on CD included with this document). For wells equipped with transducers, the reported water level is the first water-level measurement collected that day. The groundwater-elevation measurements for the General Surveillance monitoring group are shown graphically on Plates 6 and 7 for the Los Alamos/Pueblo and Mortandad/Sandia watershed portions, respectively, and Plates 8 and 9 for the Pajarito watershed portion and Water Canyon/Cañon de Valle watershed portions, respectively.

Base-flow measurements are shown graphically on Plates 10 and 11 for the Mortandad/Sandia and White Rock Canyon/Rio Grande watershed portions of the General Surveillance monitoring group, respectively.

4.4 Deviations from Planned Scope

Table 4.4-1 summarizes the deviations from the planned monitoring scope that were experienced while conducting the work associated with the monitoring data reported in this PMR.

Table 4.4-2 presents a list of analytes with method detection limits (MDLs) greater than screening values. MDLs vary for an analyte if that analyte was measured using more than one analytical method and the amount of sample extracted for analysis varied. The techniques and methods available to N3B-subcontracted laboratories at the time these analyses were conducted resulted in MDLs greater than the screening values. The analytical method and analytical laboratory are included in Table 4.4-2 for reference.

5.0 ANALYTICAL DATA RESULTS

5.1 Methods and Procedures

Methods and procedures used to perform PME analytical activities are documented in the MY 2017 IFGMP (LANL 2016, 601506) and the MY 2018 IFGMP (LANL 2017, 602406). Purge water is managed and characterized in accordance with the waste characterization strategy form associated with the well and the "Land Application of Groundwater" procedure. The "Land Application of Groundwater" procedure implements the NMED-approved decision tree for land application of drilling, development, rehabilitation, and purge water.

All sampling, data reviews, and data package validations were conducted using standard operating procedures (SOPs) that are part of a comprehensive quality assurance program. N3B has received ownership of all applicable procedures and is operating to them. Completed chain-of-custody forms serve as analytical request forms and include the requester or owner, field sample ID, program code, date and time of sample collection, sample matrix, total number of bottles, list of analytical groups to be measured, bottle sizes, and preservatives for each required analysis.

Data validation determines the quality of an analytical data set and focuses on specific quality control (QC) samples, such as matrix spikes, duplicates, surrogates, method blanks, and laboratory control samples, as well as evaluating holding times, all of which indicate the accuracy and precision of the analyses. Based on the results, data qualifiers are applied to indicate data quality issues as well as the usability of results. This process also includes a description of the reasons for any failure to meet method, procedural, or contractual requirements and an evaluation of the impact of such failure on the overall data set.

The required analytical laboratory batch QC is defined by the analytical method, the analytical statement of work, and generally accepted industry practices. The analytical laboratory assigns qualifiers to the data to indicate the quality of the analytical results. The laboratory batch QC is used by the analytical laboratory in a data validation process to evaluate the quality of individual analytical results.

In addition to batch QC performed by analytical laboratories, in-house field QC samples are submitted to test the overall field sampling program and to provide additional QC on the laboratory analytical process. The field QC sample results may be used in additional focused validation, along with information provided by the analytical laboratory.

After the analytical laboratory submits data packages, the data in the packages receive in-house secondary validation. As a result of secondary validation, a second set of qualifiers is assigned to the analytical results. Secondary validation is currently done by an automated process after the data are loaded.

Auto validation ensures that the electronic data deliverable contains all the required fields, verifies that results of all QC checks and procedures are within valid criteria limits, and applies specific qualifiers and reason codes per EPA's National Functional Guidelines for data review in addition to the internal data validation SOPs. After auto validation is completed, the data are uploaded into the internal database system and the public database (http://intellusnm.com/).

A detection status is assigned to the analytical result based on the analytical laboratory and secondary validation qualifiers. A detect flag of "N" indicates that, based on the qualifiers, the result was not detected.

5.2 Analytical Data

Appendix C presents the analytical data for the 10 PMEs reported in this PMR and from the 4 sampling events at these locations immediately before these PMEs. The analytical laboratory reports (including chain-of-custody forms and data validation forms) are provided in Appendix F (on CD included with this document).

Appendix C contains all data collected during the PMEs (i.e., all data that have been independently reviewed for conformance with Laboratory requirements) with the following constraints.

- All data
    - ❖ Data that are R-qualified (rejected because of noncompliance regarding QC acceptance criteria) during independent validation are considered unusable but are still reported.

- ❖ Analytical laboratory QC results, including matrix spikes and matrix spike duplicates, and field blanks, trip blanks, and equipment blanks are not included in the data set.
- ❖ Field duplicates, re-analyses, and results from different analytical methods are reported.

- Radionuclides
  - ❖ Only cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22 are reported (or analyzed) for the gamma spectroscopy suite.
  - ❖ Americium-241 and uranium-235 are reported only by chemical separation alpha spectroscopy. No gamma spectroscopy results are presented for these analytes.
  - ❖ Other than above, all results are reported at all locations.
- Nonradionuclides
  - ❖ All detected results are reported.

Multiple analyses of a sample, including dilutions and reanalyses, create redundant results. These multiple results have the same sample ID, analytical laboratory code, and analytical method. The analytical and validation information is used to designate the preferred result, which is marked with a best value flag of “Y” (yes). The redundant values of lower quality are assigned a best value flag of “N” (no). In cases where a reanalysis gives a significantly different result than an earlier value, the original result may be rejected and assigned a best value flag of N, and the reanalysis result may be marked with a best value flag of Y. The best value flag is included in Appendix C.

Monitoring data are evaluated using the screening process described below. The sources for standards and screening levels from which specific screening values are established are listed in Table 3.0-1.

- The base-flow monitoring locations are assigned to one of two screening categories—perennial or ephemeral (Table 5.2-1). Along with a hardness value, this category determines the screening values used for data at each monitoring location. Hardness-dependent screening values used to screen data at each base-flow monitoring location are determined using the geometric mean of hardness data (mg/L as calcium carbonate) collected from 2006 to 2010 at each location. Hardness-dependent acute and chronic criteria were used for total recoverable aluminum and dissolved cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc in accordance with the requirements of 20 New Mexico Administrative Code (NMAC) 6.4.900.
- Groundwater data are screened in accordance to Section IX of the Consent Order. For an individual substance, the lower of the NMWQCC groundwater standard or EPA MCL is used as the screening value.
- If an NMWQCC groundwater standard or an MCL has not been established for a specific substance for which toxicological information is published, the NMED screening level for tap water is used as the groundwater screening value. The NMED screening levels are for either a cancer- or noncancer-risk type. For the cancer-risk type, the screening levels are based on a 10^{-5} excess cancer risk. This report was prepared using the March 2017 NMED screening levels for tap water.
- If an NMED screening level for tap water has not been established for a specific substance for which toxicological information is published, the EPA regional screening level for tap water is used as the groundwater screening value. The EPA screening levels are for either a cancer- or noncancer-risk type. For the cancer-risk type, the Consent Order specifies screening at a 10^{-5} excess cancer risk. The EPA screening levels for tap water are for 10^{-6} excess cancer risk, so 10 times the EPA 10^{-6} screening levels are used in the screening process. This report was prepared using the November 2017 EPA regional screening levels for tap water.

- The NMWQCC groundwater standards apply to the dissolved (filtered) portion of specified contaminants; however, the standards for mercury, organic compounds, and nonaqueous-phase liquids apply to the total unfiltered concentrations of the contaminants. EPA MCLs are applied to both filtered and unfiltered sample results.
- The analytical results for radionuclides and radioactivity are voluntarily compared with the DOE Biota Concentration Guides (BCGs) for surface water and Derived Concentration Technical Standards (DCSs) for groundwater but are not reported in Table 5.2-2 or Appendix D.

Appendix D presents each analytical result that is greater than half of its applicable screening value. Results with a best value flag of N are included in Appendix D but not discussed in the text.

Table 5.2-2 provides groundwater analytical results (by hydrogeologic zone for a specific analytical suite) that are above screening values. Multiple detections are included in the table except for field duplicate exceedances. For example, if aluminum was detected above its screening value in both a primary sample and a field duplicate, only the primary sample result is shown. If aluminum was detected above its screening value in two primary samples, both results are shown.

For the data reported in this PMR, Plates 12 and ~~Plate~~ 13 present~~s~~ the maximum concentrations detected at General Surveillance monitoring group locations for the analytes ~~which~~ that exceeded the respective screening values at more than one sampling location. For example, filtered manganese was detected above the NMWQCC groundwater standard (screening value) at more than one spring, and all manganese values reported are shown in addition to the screening value exceedances, which are highlighted.

Graphs in Appendix E display analyte concentration histories for monitoring group locations where the analyte was above its screening value at least once in the following expanded data set: data reported in this PMR plus data for the three previous General Surveillance monitoring group PMEs. Appendix E may include instances where the analyte data reported in this PMR are evaluated using a higher screening value than the screening value that was used to evaluate previously reported analyte data. For example, the current screening value for perchlorate, 13.8 µg/L per 2016 Consent Order data screening requirements, is greater than the former perchlorate screening value of 4 µg/L, which was used to evaluate previously reported analyte data. The horizontal solid red line on each graph depicts the current analyte screening value, except in cases where there were no exceedances of the current screening value by the data reported in this PMR but there was at least one exceedance of the former (lower) screening value by the previously reported analytical data. In such cases, the horizontal solid red line depicts the former (lower) screening value. Results with a best value flag of N are not included in Appendix E.

5.2.1 Surface Water (Base Flow)

Table 5.2-2 shows that three~~one~~ surface-water analytical results reported in this PMR ~~was~~ were above the applicable screening value. ~~This~~ These screening value exceedances were~~as~~ for unfiltered aluminum~~,~~ and for filtered copper.

Mortandad at Rio Grande

The base-flow sample collected at Mortandad at Rio Grande consists of effluent from the White Rock wastewater treatment plant, and the samples are more indicative of urban impacts than from Laboratory impacts.

For the sample collected on October 10, 2017, unfiltered aluminum was detected at 1380 µg/L, which exceeds the hardness-based NMWQCC aquatic life standard for chronic exposure of 1010 µg/L (based on

80 mg/L hardness). In addition, filtered copper was detected at 13.3 µg/L, which exceeds the NMWQCC aquatic life standard for acute and chronic exposure, 11 µg/L and 7 µg/L, respectively (based on 80 mg/L hardness). The range of previous unfiltered aluminum concentrations detected at Mortandad at Rio Grande since September 2010 is 295 µg/L to 602 µg/L. The range of previous filtered copper concentrations detected at Mortandad at Rio Grande since September 2009 is 11.4 µg/L to 14.5 µg/L.

Rio Grande at Otowi Bridge

For the October 4, 2017, sampling event at location Rio Grande at Otowi Bridge, unfiltered aluminum was detected at 9660 µg/L. This concentration was above the hardness-based NMWQCC aquatic life standard for chronic exposure (screening value) of 1370 µg/L (based on 100 mg/L hardness). The range of previous unfiltered aluminum concentrations detected at Rio Grande at Otowi Bridge since July 2008 is 650 µg/L to 5960 µg/L.

5.2.2 Groundwater

Table 5.2-2 shows that eight groundwater analytical results reported in this PMR were above applicable screening values. These eight screening value exceedances were for the following six analytes: chloride (filtered), cyanide (unfiltered), 1,4-dioxane (unfiltered), manganese (filtered), 1,1,1-trichloroethane (unfiltered), and total dissolved solids (TDS) (filtered).

Groundwater Springs

Lower Sandia Spring

For the October 3, 2017, sampling event at Lower Sandia Spring, manganese was detected at 340 µg/L. This concentration was above the NMWQCC groundwater standard (screening value) of 200 µg/L. This result is from the first sampling event at Lower Sandia Spring.

Sacred Spring

For the October 3, 2017, sampling event at Sacred Spring, manganese was detected at 302 µg/L. This concentration was above the NMWQCC groundwater standard (screening value) of 200 µg/L. Previous manganese concentrations detected at Sacred Spring since 2005 range from 31.5 µg/L to 994 µg/L.

Spring 3AA

For the October 10, 2017, sampling event at Spring 3AA, cyanide was detected at 0.228 mg/L. This concentration was above the EPA MCL (screening value) of 0.2 mg/L. This result was the first detection of cyanide at Spring 3AA. The range of previous cyanide detection limits at Spring 3AA since 2005 is 0.0015 µg/L to 0.0025 µg/L.

Alluvial Monitoring Wells

18-MW-18

For the April 11, 2018, sampling event at 18-MW-18, chloride was detected at 399 mg/L and TDS were detected at 1010 mg/L. These concentrations were above the NMWQCC groundwater standards (screening values) of 250 mg/L for chloride and 1000 mg/L for TDS, respectively.

The range of chloride concentrations previously detected at 18-MW-18 since August 2006 is 51.3 mg/L to 539 mg/L. TDS concentrations previously detected at 18-MW-18 since August 2006 range from 235 mg/L to 1470 mg/L.

Intermediate Monitoring Wells

03-B-13

For the November 1, 2017, sampling event at 03-B-13, 1,4-dioxane was detected at 47 µg/L. For the April 10, 2018, sampling event at 03-B-13, 1,4-dioxane was detected at 45 µg/L and 1,1,1-trichloroethane was detected at 71 µg/L. These concentrations were above the NMED tap water screening level (screening value) of 4.59 µg/L for 1,4-dioxane and the NMWQCC groundwater standard (screening value) of 60 µg/L for 1,1,1-trichloroethane.

The range of 1,4-dioxane concentrations previously detected at 03-B-13 since June 2006 is 6.22 µg/L to 4640 µg/L. The 1,1,1-trichloroethane concentrations previously detected at 03-B-13 since June 2006 range from 39.9 µg/L to 275 µg/L.

5.3 Sampling Program Modifications

No modifications to the currently planned periodic monitoring of the General Surveillance monitoring group are proposed at this time.

6.0 SUMMARY AND INTERPRETATIONS

6.1 Monitoring Results

Appendix A presents the field parameter measurements associated with the sampling and analysis data that are reported in this PMR.

6.2 Analytical Results

6.2.1 Surface Water (Base Flow)

ThreeOne surface water analytical results reported in this PMR wereas above the applicable screening value (Table 5.2-2). The unfiltered aluminum concentration (9660 µg/L) detected at Rio Grande at Otowi Bridge on October 4, 2017, is the highest observed at this location to date. The unfiltered aluminum concentration (1380 µg/L) detected at Mortandad at Rio Grande on October 10, 2017, is the highest observed at this location to date.

6.2.2 Groundwater

A total of eight groundwater analytical results reported in this PMR were above applicable screening values (Table 5.2-2). For results above screening values, the types of contaminants detected and their concentrations are consistent with data reported in previous PMRs for this monitoring group, with the following exceptions.

- The filtered manganese concentration (340 µg/L) detected at Lower Sandia Spring on October 3, 2017, is the first sample collected at this location.
- The unfiltered cyanide concentration (0.228 mg/L) detected at Spring 3AA on October 10, 2017, is the first detection of cyanide at this location.

6.3 Data Gaps

Table 4.4-1 summarizes the deviations from the planned monitoring scope that were experienced while conducting the work associated with the monitoring data reported in this PMR.

6.4 Remediation System Monitoring

Remediation system monitoring is not applicable to the General Surveillance monitoring group because no systems are installed in this monitoring group.

7.0 REFERENCES

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.

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Table 2.0-1
General Surveillance Monitoring Group Locations and General Information

Location Name	Watershed	Sampling Event		Sample Collection Date	Screened Interval (ft)	Screen Top Depth (ft)	Screen Bottom Depth (ft)	Calculated Single Casing Volume (gal.)	Purge Volume (gal.)	Purge or Flow Rate (gpm[a])
		MY	Quarter							
Base Flow										
Sandia below Wetlands	Sandia	2017	4	08/08/17	n/a[b]	n/a	n/a	n/a	n/a	112.21
Sandia right fork at Power Plant	Sandia			08/08/17	n/a	n/a	n/a	n/a	n/a	49.37
LA Canyon near Otowi Bridge	Los Alamos	2018	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mortandad at Rio Grande	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	130
Rio Grande at Otowi Bridge	White Rock			10/04/17	n/a	n/a	n/a	n/a	n/a	601,432
Two Mile Canyon below TA-59	Pajarito	2018	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Springs										
Ancho Spring	White Rock	2018	1	10/11/17	n/a	n/a	n/a	n/a	n/a	0.34
La Mesita Spring	White Rock			10/04/17	n/a	n/a	n/a	n/a	n/a	0.94
Los Alamos Spring	Los Alamos			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lower Sandia Spring	White Rock			10/03/17	n/a	n/a	n/a	n/a	n/a	0.15
Sacred Spring	White Rock			10/03/17	n/a	n/a	n/a	n/a	n/a	0.44
Sandia Spring	White Rock			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Spring 1	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	0.3
Spring 2	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	0.07
Spring 3	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	20.6
Spring 3A	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	40.4
Spring 3AA	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	0.48
Spring 4	White Rock			10/10/17	n/a	n/a	n/a	n/a	n/a	43.5
Spring 4A	White Rock			10/11/17	n/a	n/a	n/a	n/a	n/a	NM[c]
Spring 4AA	White Rock			10/11/17	n/a	n/a	n/a	n/a	n/a	NM
Spring 4B	White Rock			10/11/17	n/a	n/a	n/a	n/a	n/a	0.12

Table 2.0-1 (continued)

Location Name	Watershed	Sampling Event		Sample Collection Date	Screened Interval (ft)	Screen Top Depth (ft)	Screen Bottom Depth (ft)	Calculated Single Casing Volume (gal.)	Purge Volume (gal.)	Purge or Flow Rate (gpm[a])
		MY	Quarter							
Spring 5	White Rock	2018 (cont'd)	1 (cont'd)	10/11/17	n/a	n/a	n/a	n/a	n/a	5.94
Spring 5A	White Rock			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Spring 5B	White Rock			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Spring 6	White Rock			10/11/17	n/a	n/a	n/a	n/a	n/a	12
Spring 6A	White Rock			10/12/17	n/a	n/a	n/a	n/a	n/a	3.21
Spring 8A	White Rock			10/12/17	n/a	n/a	n/a	n/a	n/a	1.96
Spring 9	White Rock			10/12/17	n/a	n/a	n/a	n/a	n/a	0.82
Spring 9A	White Rock			10/12/17	n/a	n/a	n/a	n/a	n/a	1.1
Upper Mesita Spring	White Rock			10/04/17	n/a	n/a	n/a	n/a	n/a	1
Vine Tree Spring	Los Alamos			12/12/17	n/a	n/a	n/a	n/a	n/a	4.38
Los Alamos Spring	Los Alamos	2018	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Homestead Spring	Pajarito			4/18	n/a	n/a	n/a	n/a	n/a	3.17
Starmer Spring	Pajarito			4/18	n/a	n/a	n/a	n/a	n/a	1.74
Vine Tree Spring	Los Alamos			06/19/18	n/a	n/a	n/a	n/a	n/a	5.83
Alluvial										
CDBO-6	Mortandad	2017	4	n/a	10	34	44	n/a	n/a	n/a
MCO-5	Mortandad			n/a	25	21	46	n/a	n/a	n/a
MCO-7	Mortandad			08/07/17	30	39	69	10.4	11.9	0.19–0.2[d]
SCA-3	Sandia			n/a	4.4	27.6	32	n/a	n/a	n/a
WCO-1r	Water			n/a	10	6.02	16.02	n/a	n/a	n/a
LLAO-1b	Los Alamos	2018	1	n/a	10	11.32	21.32	n/a	n/a	n/a
LLAO-4	Los Alamos			12/13/17	10	5.24	15.24	7.51	7.75	0.25
WCO-1r	Water	2018	2	n/a	10	6.02	16.02	n/a	n/a	n/a
18-MW-18	Pajarito	2018	3	04/11/18	10.5	12.5	23	1.32	3	0.04–0.25[d]

Table 2.0-1 (continued)

Location Name	Watershed	Sampling Event		Sample Collection Date	Screened Interval (ft)	Screen Top Depth (ft)	Screen Bottom Depth (ft)	Calculated Single Casing Volume (gal.)	Purge Volume (gal.)	Purge or Flow Rate (gpm[a])
		MY	Quarter							
LAO-3a	Los Alamos	2018 (cont'd)	3 (cont'd)	06/18/18	10	4.7	14.7	1	1.8	0.15
LLAO-1b	Los Alamos			n/a	10	11.32	21.32	n/a	n/a	n/a
LLAO-4	Los Alamos			06/19/18	10	5.24	15.24	6.65	7	0.25
LAUZ-1	Los Alamos			n/a	5	5.35	10.35	n/a	n/a	n/a
PAO-5n	Pueblo			06/12/18	5	7.43	12.43	2.79	1.92	0.06
PCAO-8	Pajarito			n/a	10	9.7	19.7	n/a	n/a	n/a
Intermediate										
R-12 S1	Sandia	2017	4	07/27/17	8.5	459	467.5	31.97	109	1.15
R-12 S2	Sandia			07/27/17	3.5	504.5	508	53.77	270	10
03-B-13	Pajarito	2018	1	11/01/17	10	21.5	31.5	1.62	4.87	0.053
PCI-2	Pajarito			11/01/17	10	512	522	20.9	62.7	0.51
03-B-13	Pajarito	2018	3	04/10/18	10	21.5	31.5	1.57	4.9	0.079
PCI-2	Pajarito			04/17/18	10	512	522	20.9	64.8	0.48
POI-4	Pueblo			n/a	15	159	174	n/a	n/a	n/a
R-3i	Pueblo			06/21/18	4.8	215.2	220	3.07	12.8	0.85
TW-2Ar	Pueblo			n/a	10	102	112	n/a	n/a	n/a
Regional										
R-10 S1	Sandia	2017	4	n/a	23	874	897	n/a	n/a	n/a
R-10 S2	Sandia			n/a	23	1042	1065	n/a	n/a	n/a
R-10a	Sandia			08/09/17	10	690	700	65.8	200	5
R-16 S2	Mortandad			07/27/17	7.5	863.4	870.9	218	657	5.17
R-16 S4	Mortandad			07/27/17	7.6	1237	1244.6	44.4	236	3.37
R-16r	Mortandad			07/31/17	17.6	600	617.6	54.1	166	5.55
R-34	Mortandad			08/08/17	22.9	883.7	906.6	99.9	446	2.88
R-10 S1	Sandia	2018	1	n/a	23	874	897	n/a	n/a	n/a
R-10 S2	Sandia			n/a	23	1042	1065	n/a	n/a	n/a

Table 2.0-1 (continued)

Location Name	Watershed	Sampling Event		Sample Collection Date	Screened Interval (ft)	Screen Top Depth (ft)	Screen Bottom Depth (ft)	Calculated Single Casing Volume (gal.)	Purge Volume (gal.)	Purge or Flow Rate (gpm[a])
		MY	Quarter							
R-10a	Sandia	2018 (cont'd)	1 (cont'd)	11/16/17	10	690	700	65.8	223	6.38
R-34	Mortandad			11/15/17	22.9	883.7	906.6	99.8	300	2.75
R-2	Pueblo	2018	3	n/a	23.3	906.4	929.6	n/a	n/a	n/a
R-3	Pueblo			06/21/18	20.5	974.5	995	352	1080	6
R-4	Pueblo			06/26/18	23.1	792.9	816	73.8	237	5.26
R-10a	Sandia			05/15/18	10	690	700	65.7	203	5.08
R-17 S1	Pajarito			04/19/18	23	1057	1080	50.6	158	2.11
R-17 S2	Pajarito			04/19/18	10	1124	1134	28.7	89.6	2.24
R-24	Pueblo			06/25/18	23	825	848	115	347	4.62

[a] gpm = Gallons per minute.

[b] n/a = Not applicable.

[c] NM = Not measured. Unable to measure flow because of field conditions.

[d] Flow rate was not constant and range of flows is presented.

Table 3.0-1
Sources for Standards and Screening Levels for
Groundwater and Surface Water at Los Alamos National Laboratory

Standard Source	Standard Type	Groundwater	Surface Water
DOE Order 458.1	DOE BCG	n/a[a]	X[b]
DOE Order 458.1	DOE 100-mrem Public Dose DCS	X	n/a
DOE Order 458.1	DOE 4-mrem Drinking Water DCS	X	n/a
40 CFR[c] 141	EPA MCL	X	n/a
NMED Screening Levels[d]	Screening Levels for Tap Water	X	n/a
EPA Regional Screening Levels[e]	Screening Levels for Tap Water	X	n/a
20 NMAC 6.2.3103	NMWQCC Groundwater Standard	X	n/a
20 NMAC 6.4.900.C	NMWQCC Irrigation Standard	n/a	X
20 NMAC 6.4.900.F	NMWQCC Livestock Watering Standard	n/a	X
20 NMAC 6.4.900.G	NMWQCC Wildlife Habitat Standard	n/a	X
20 NMAC 6.4.900.H	NMWQCC Aquatic Life Standards Acute	n/a	X[f, g]
20 NMAC 6.4.900.H	NMWQCC Aquatic Life Standards Chronic	n/a	X[f, g]
20 NMAC 6.4.900.H	NMWQCC Aquatic Life Human Health Standard	n/a	X

[a] n/a = Not applicable.

[b] X = Applied to data screen for this report.

[c] CFR = Code of Federal Regulations.

[d] Reference: "Risk Assessment Guidance for Site Investigations and Remediation," New Mexico Environment Department, March 2017 (NMED 2017, 602273).

[e] Available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

[f] Hardness-based standards for total recoverable aluminum and dissolved chromium(III) conservatively compared with results for total aluminum and dissolved chromium, respectively.

[g] Standard for dissolved chromium(VI) conservatively compared with results for dissolved chromium https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Table 4.4-1
General Surveillance Monitoring Group PME Observations and Deviations

Monitoring Location	Watershed	Sampling Event		Observation/Deviation	Cause	Comment
		MY	Quarter			
CBDO-6	Mortandad	2017	4	A sample was not collected.	The location had insufficient water for sampling. Sampling was cancelled on 07/12/17.	None
MCO-5	Mortandad			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 08/07/17.	None
MCO-7	Mortandad			Seal on field trip blank for VOC sample collected on 08/07/17 was broken.	Unknown	Sample Management Office was contacted and approved use of field trip blank with broken seal.
R-10 S1	Sandia			A sample was not collected.	Sampling at this location was cancelled.	Sampling pump was not working because of mechanical problems.
R-10 S2	Sandia			A sample was not collected.	Sampling at this location was cancelled.	Sampling pump was not working because of mechanical problems.
SCA-3	Sandia			A sample was not collected.	The location had insufficient water for sampling. Sampling was cancelled on 07/12/17.	None
WCO-1r	Water			A sample was not collected.	The location had insufficient water for sampling. Sampling was cancelled on 09/08/17.	None
LA Canyon near Otowi Bridge	Los Alamos	2018	1	A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 12/13/17.	None
LLAO-1b	Los Alamos			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 12/13/17.	None
Los Alamos Spring	Los Alamos			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 12/12/17.	None

Table 4.4-1 (continued)

Monitoring Location	Watershed	Sampling Event		Observation/Deviation	Cause	Comment
		MY	Quarter			
R-10 S1	Sandia	2018 (cont'd)	1 (cont'd)	A sample was not collected.	Sampling at this location was cancelled on 11/14/17.	Sampling pump was not working because of mechanical problems.
R-10 S2	Sandia			A sample was not collected.	Sampling at this location was cancelled on 11/14/17.	Sampling pump was not working because of mechanical problems.
Sandia Spring	White Rock			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 10/03/17.	None
Spring 5A	White Rock			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 10/11/17.	None
Spring 5B	White Rock			A sample was not collected.	The sampling location was under water due to high Rio Grande water level. Sampling was cancelled on 10/11/17.	None
WCO-1r	Water	2018	2	A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 02/09/18.	None
LLAO-1b	Los Alamos	2018	3	A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 06/19/18.	None
LAUZ-1	Los Alamos			A sample was not collected.	The site could not be located. Sampling was cancelled on 06/19/18.	None
Los Alamos Spring	Los Alamos			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 06/19/18.	None

Table 4.4-1 (continued)

Monitoring Location	Watershed	Sampling Event		Observation/Deviation	Cause	Comment
		MY	Quarter			
PAO-5n	Pueblo	2018 (cont'd)	3 (cont'd)	A prioritized sampling suite was collected.	A limited volume of water was available for sample collection.	Samples for metals, VOCs, SVOCs*, general inorganics (partial), and radionuclides (partial) analysis were collected according to the prioritized sampling protocol for the well.
PCAO-8	Pajarito			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 04/11/18.	None
POI-4	Pueblo			A sample was not collected.	The location was inaccessible due to stage 3 fire restrictions.	None
R-2	Pueblo			A sample was not collected.	The location was inaccessible due to stage 3 fire restrictions.	None
TW2-AR	Pueblo			A sample was not collected.	The location was inaccessible due to stage 3 fire restrictions.	None
Two Mile Canyon below TA-59	Pajarito			A sample was not collected.	The location had insufficient water for sampling. The attempted sampling date was 04/18/18.	None

*SVOC = Semivolatile organic compound.

Table 4.4-2
Target Analytes with MDLs Above Screening Values

Analyte Name	MDL	Analytical Method	Screening Value	Unit	Screening-Value Type	Lab ID
Metals						
Thallium	0.6	SW-846:6020	0.47	µg/L	NM HH OO[a]	GEL[b]
Polychlorinated Biphenyls						
Aroclor-1016	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic[c]	GEL
Aroclor-1221	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1232	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1242	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1248	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1254	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1260	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Aroclor-1262	0.037–0.0347	SW-846:8082	0.00064, 0.014	µg/L	NM HH OO, NM Aquatic Chronic	GEL
Semivolatile Organic Compounds						
Atrazine	3–4.17	SW-846:8270D	3	µg/L	EPA MCL	GEL
Azobenzene	3–4.17	SW-846:8270D	1.2	µg/L	EPA TAP SCRN LVL[d]	GEL
Benzidine	3.9–5.42	SW-846:8270D	0.00109, 0.002	µg/L	NMED A1 TAP SCRN LVL[e], NM HH OO	GEL
Benzo(a)anthracene	0.3–0.417	SW-846:8270D	0.12, 0.18	µg/L	NMED A1 TAP SCRN LVL, NM HH OO	GEL
Benzo(a)pyrene	0.3–0.417	SW-846:8270D	0.18, 0.2	µg/L	NM HH OO, EPA MCL	GEL
Benzo(b)fluoranthene	0.3–0.417	SW-846:8270D	0.18, 0.343	µg/L	NM HH OO, NMED A1 TAP SCRN LVL	GEL
Benzo(k)fluoranthene	0.313	SW-846:8270D	0.18	µg/L	NM HH OO	GEL
Bis(2-chloroethyl)ether	3–4.17	SW-846:8270D	0.137	µg/L	NMED A1 TAP SCRN LVL	GEL
Chloroaniline[4-]	3.3–4.58	SW-846:8270D	3.7	µg/L	EPA TAP SCRN LVL	GEL
Chrysene	0.313	SW-846:8270D	0.18	µg/L	NM HH OO	GEL

Table 4.4-2 (continued)

Analyte Name	MDL	Analytical Method	Screening Value	Unit	Screening-Value Type	Lab ID
Dibenz(a,h)anthracene	0.3–0.417	SW-846:8270D	0.0343, 0.18	µg/L	NMED A1 TAP SCRN LVL, NM HH OO	GEL
Dichlorobenzidine[3,3'-]	3.13–4.17	SW-846:8270D	0.28, 1.25	µg/L	NM HH OO, NMED A1 TAP SCRN LVL	GEL
Dinitro-2-methylphenol[4,6-]	3–4.17	SW-846:8270D	1.52	µg/L	NMED A1 TAP SCRN LVL	GEL
Dinitrotoluene[2,4-]	3–4.17	SW-846:8270D	2.37	µg/L	NMED A1 TAP SCRN LVL	GEL
Dinitrotoluene[2,6-]	3–4.17	SW-846:8270D	0.485	µg/L	NMED A1 TAP SCRN LVL	GEL
Hexachlorobenzene	3.13–4.17	SW-846:8270D	0.0029, 1	µg/L	NM HH OO, EPA MCL	GEL
Hexachlorobutadiene	3–4.17	SW-846:8270D	1.39	µg/L	NMED A1 TAP SCRN LVL	GEL
Hexachloroethane	3–4.17	SW-846:8270D	3.28	µg/L	NMED A1 TAP SCRN LVL	GEL
Indeno(1,2,3-cd)pyrene	0.313–0.417	SW-846:8270D	0.18, 0.343	µg/L	NM HH OO, NMED A1 TAP SCRN LVL	GEL
Nitrobenzene	3–4.17	SW-846:8270D	1.4	µg/L	NMED A1 TAP SCRN LVL	GEL
Nitroso-di-n-butylamine[N-]	3–4.17	SW-846:8270D	0.0273	µg/L	NMED A1 TAP SCRN LVL	GEL
Nitroso-di-n-propylamine[N-]	3–4.17	SW-846:8270D	0.11	µg/L	EPA TAP SCRN LVL	GEL
Nitrosodiethylamine[N-]	3–4.17	SW-846:8270D	0.00167	µg/L	NMED A1 TAP SCRN LVL	GEL
Nitrosodimethylamine[N-]	3–4.17	SW-846:8270D	0.00491	µg/L	NMED A1 TAP SCRN LVL	GEL
Nitrosopyrrolidine[N-]	3–4.17	SW-846:8270D	0.37	µg/L	NMED A1 TAP SCRN LVL	GEL
Pentachlorobenzene	3–4.17	SW-846:8270D	3.07	µg/L	NMED A1 TAP SCRN LVL	GEL
Pentachlorophenol	3–4.17	SW-846:8270D	1	µg/L	EPA MCL	GEL
Tetrachlorobenzene[1,2,4,5]	3–4.17	SW-846:8270D	1.66	µg/L	NMED A1 TAP SCRN LVL	GEL
Volatile Organic Compounds						
Acrolein	1.5	SW-846:8260B	0.0415	µg/L	NMED A1 TAP SCRN LVL	GEL
Acrylonitrile	1.5	SW-846:8260B	0.523	µg/L	NMED A1 TAP SCRN LVL	GEL
Chloro-1,3-butadiene[2-]	0.3	SW-846:8260B	0.187	µg/L	NMED A1 TAP SCRN LVL	GEL
Dibromo-3-Chloropropane[1,2-]	0.5	SW-846:8260B	0.2	µg/L	EPA MCL	GEL
Dibromoethane[1,2-]	0.3	SW-846:8260B	0.05	µg/L	EPA MCL	GEL
Dibromomethane	0.3	SW-846:8260B	0.0747	µg/L	NMED A1 TAP SCRN LVL	GEL

Table 4.4-2 (continued)

Analyte Name	MDL	Analytical Method	Screening Value	Unit	Screening-Value Type	Lab ID
Trichloropropane[1,2,3-]	0.3	SW-846:8260B	0.00835	µg/L	NMED A1 TAP SCRN LVL	GEL
Dioxins and Furans						
Tetrachlorodibenzodioxin[2,3,7,8-]	3.65E-06	SW-846:8290A	5.10E-08	µg/L	NM HH OO	CFA[f]
Tetrachlorodibenzofuran[2,3,7,8-]	3.66E-06	SW-846:8290A	1.84E-06	µg/L	NMED A1 TAP SCRN LVL	CFA

Note: This table is applicable to samples reported in this PMR.

[a] NM HH OO = Human health organism only, New Mexico surface-water standards.

[b] GEL = GEL Laboratories, LLC, Division of the GEL Group, Inc., Charleston, SC.

[c] NM Aquatic Chronic = New Mexico chronic aquatic life water quality standard.

[d] EPA TAP SCRN LVL = U.S. Environmental Protection Agency screening level for tap water.

[e] NMED A1 TAP SCRN LVL = New Mexico Environment Department screening level for tap water.

[f] CFA = Cape Fear Analytical, LLC, Wilmington, NC, Division of the GEL Group, Inc., Charleston, SC.

Table 5.2-1
Base-Flow Location Type and Hardness Assignments Used to Select Screening Values

Watershed	Location	Stream Type	Hardness (mg/L as $CaCO_3$)
White Rock	~~Rio Grande at Otowi Bridge~~Mortandad at Rio Grande	~~Perennial~~Intermittent	~~100~~80
White Rock	Rio Grande at Otowi Bridge	Perennial	100
Sandia	Sandia below Wetlands	Perennial	100
Sandia	Sandia right fork at Power Plant	Perennial	100
Pajarito	Two Mile Canyon below TA-59	Ephemeral	50

Table 5.2-2
General Surveillance Monitoring Group Results Above Screening Values

Location	Watershed	Sampling Event MY	Sampling Event Quarter	Sample Collection Date	Analyte	Field Prep Code	Result	Unit	Screening Value	Screening Value Source
Base Flow										
Rio Grande at Otowi Bridge	White Rock Canyon/ Rio Grande	2018	1	10/04/17	Aluminum	UF[a]	9660	µg/L	1370	NMWQCC Aquatic Life Standards Chronic[b]
Mortandad at Rio Grande	White Rock Canyon/Rio Grande	2018	1	10/10/17	Aluminum	UF	1380	µg/L	1010	NMWQCC Aquatic Life Standards Chronic[c]
Mortandad at Rio Grande	White Rock Canyon/Rio Grande	2018	1	10/10/17	Copper	F[d]	13.3	µg/L	7	NMWQCC Aquatic Life Standards Chronic[e]
									11	NMWQCC Aquatic Life Standards Acute[e]
Springs										
Lower Sandia Spring	White Rock Canyon/ Rio Grande	2018	1	10/03/17	Manganese	F[ec]	340	µg/L	200	NMWQCC GW STD[fd]
Sacred Spring	White Rock Canyon/ Rio Grande	2018	1	10/03/17	Manganese	F	302	µg/L	200	NMWQCC GW STD
Spring 3AA	White Rock Canyon/ Rio Grande	2018	1	10/10/17	Cyanide (Total)	UF	0.228	mg/L	0.2	EPA MCL
Alluvial										
18-MW-18	Pajarito	2018	3	04/11/18	Chloride	F	399	mg/L	250	NMWQCC GW STD
18-MW-18	Pajarito	2018	3	04/11/18	TDS	F	1010	mg/L	1000	NMWQCC GW STD
Intermediate										
03-B-13	Pajarito	2018	1	11/01/17	Dioxane[1,4-]	UF	47	µg/L	4.59	NMED A1 TAP SCRN ~~LVL~~[e]LVL[g]
03-B-13	Pajarito	2018	3	04/10/18	Dioxane[1,4-]	UF	45	µg/L	4.59	NMED A1 TAP SCRN LVL
03-B-13	Pajarito	2018	3	04/10/18	Trichloroethane[1,1,1-]	UF	71	µg/L	60	NMWQCC GW STD

[a] UF = Unfiltered.

[b] NMWQCC Aquatic Life Standards Chronic = New Mexico Water Quality Control Commission aquatic life standards for chronic exposure based on 100 mg/L total hardness.

[c] NMWQCC Aquatic Life Standards Chronic = New Mexico Water Quality Control Commission aquatic life standards for chronic exposure based on 80 mg/L total hardness

[d] F = Filtered.

[e] NMWQCC Aquatic Life Standards Acute = New Mexico Water Quality Control Commission aquatic life standards for acute exposure based on 80 mg/L total hardness.

[df] NMWQCC GW STD = New Mexico Water Quality Control Commission groundwater standard.

[eg] NMED A1 TAP SCRN LVL = New Mexico Environment Department screening level for tap water.