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2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1

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Responsible project manager:

Steve Paris		Project Manager	Environmental Programs	12/8/11
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Michael J. Graham	B-G Schappell	Associate Director	Environmental Programs	12/9/11
Printed Name	Signature	Title	Organization	Date

Responsible DOE representative:

George J. Rael	Cheryl J Rodriguez for	Manager	DOE-LASO	12/14/2011
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This Interim Facility-Wide Groundwater Monitoring Plan (hereafter, the Interim Plan) fulfills a requirement of the Compliance Order on Consent (hereafter, the Consent Order). Los Alamos National Laboratory (the Laboratory) will collect and analyze groundwater and surface water samples at specific locations and for specific constituents to fulfill the requirements of the Consent Order. Groundwater-level data will also be collected because they are critical to understanding groundwater occurrence and movement. Four types of water are monitored: base flow (persistent surface water), alluvial groundwater, intermediate-perched groundwater, and regional aquifer groundwater. This Interim Plan is updated annually and submitted to the New Mexico Environment Department (NMED) for its approval. The 2011 Interim Plan applies to the monitoring year (MY) from October 1, 2011, to September 30, 2012. This revision of the Interim Plan will supplement the first quarter implemented under the initial 2011 Interim Plan and be in effect starting January 1, 2012.

The monitoring conducted under this plan is designed to enhance the general understanding of the groundwater within and beneath the Laboratory. These data are used for characterization purposes to support corrective measures work conducted at numerous sites around the Laboratory and to support ongoing operations. The monitoring is conducted both inside and outside of current Laboratory boundaries. Monitoring within current Laboratory boundaries takes place in seven major watershed groupings: Los Alamos Canyon/Pueblo Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon/Rio Grande.

Most of the monitoring wells discussed in the Interim Plan are assigned to area-specific monitoring groups related to project areas that may be located in more than one watershed. Area-specific monitoring groups are defined for Technical Area 54 (TA-54) in Pajarito and Mortandad Canyons; TA-21, primarily in Los Alamos Canyon; Material Disposal Area (MDA) AB, primarily in Ancho Canyon; MDA C, primarily in Mortandad Canyon; the chromium investigation area in Sandia and Mortandad Canyons; and the TA-16 260 Outfall in Water Canyon/Cañon de Valle. Locations that are not included within one of these six area-specific monitoring groups are assigned to the general surveillance monitoring group.

Monitoring outside the Laboratory boundaries is conducted in areas (1) where Laboratory operations have been conducted in the past (e.g., Guaje and Rendija Canyons) or (2) that historically have not been affected by Laboratory operations. To ensure water leaving the Laboratory does not pose an unacceptable risk to human and ecological receptors, this plan also includes monitoring in areas downgradient of the Laboratory and outside Laboratory boundaries (e.g., the Rio Grande and springs in White Rock Canyon).

Monitoring locations were initially derived from Table XII-5 of the Consent Order, but the current list of monitoring locations represents the most recent results of subsequent annual updates to the 2005 Interim Plan. The locations, analytical suites, and frequency of monitoring reflect the technical and regulatory status of each area-specific monitoring group.

The monitoring data collected under this plan are published in periodic monitoring reports submitted to NMED and analytical results are made available to the public in the Risk Analysis, Communication, Evaluation, and Reduction database (http://racernm.com). In addition, groundwater data collected by the Laboratory are reviewed monthly, and constituents exceeding any of the seven screening criteria laid out in the Consent Order, modified May 13, 2008, are reported monthly to the NMED Hazardous Waste Bureau.

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1.0 INTRODUCTION

The 2011 Interim Facility-Wide Groundwater Monitoring Plan (hereafter, the Interim Plan) for Los Alamos National Laboratory (LANL or the Laboratory) fulfills the groundwater monitoring requirement in Section IV.A.3.b of the March 1, 2005, Compliance Order on Consent (Consent Order). Section IV.A.3.b requires the Interim Plan to be updated annually and anticipates that monitoring plans for specific areas will change as the groundwater investigation objectives in Section IV.A.3.a are met. The monitoring year (MY) for the Interim Plan is from October 1, 2011, to September 30, 2012. This revision of the Interim Plan will supplement the first quarter implemented under the initial 2011 Interim Plan and be in effect starting January 1, 2012.

Groundwater monitoring has been conducted at the Laboratory for over 60 yr, starting with U.S. Geological Survey (USGS) water-supply studies in 1945 and Laboratory groundwater quality monitoring in 1949. The first groundwater-monitoring network consisted of water-supply wells, several observation wells, and springs. The monitoring network continued to evolve through the years as various environmental investigations installed additional wells, primarily in the shallow alluvial systems, as potential monitoring points.

Between 1997 and 2005, the Laboratory implemented a sitewide hydrogeologic characterization program, described in the Laboratory's "Hydrogeologic Workplan" (LANL 1998, 059599). The primary objective of this characterization program was to refine the Laboratory's understanding of the area's hydrogeologic systems and to improve its ability to design and implement an integrated sitewide groundwater monitoring plan. Building upon information obtained from this and other programs, the Laboratory has subsequently refined the monitoring-network design and implementation through a series of monitoring-well network evaluation reports and the delineation of area-specific monitoring groups in this plan.

This plan consists of nine sections, including this introduction, with supporting appendixes. Sections 2 through 7 describe the monitoring and site activities conducted in six area-specific monitoring groups: Technical Area 21 (TA-21); chromium investigation; MDA C; MDAs G, H, and L at TA-54; TA-16 260 Outfall; and MDA AB. Section 8 describes general surveillance monitoring in seven major watersheds or watershed groupings: Los Alamos Canyon/Pueblo Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, the combined watersheds of Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon/Rio Grande. Section 9 includes a list of references cited in this report and the map data sources.

Appendix A is the list of acronyms and abbreviations used in the report, a metric conversion table, and the definitions of data qualifiers. Appendix B presents screening results for data collected in the six area-specific monitoring groups and seven watershed groupings. Appendix C summarizes the methods and procedures used to conduct monitoring and the management of investigation-derived waste (IDW). Appendix D summarizes the objectives of the monitoring performed and the sampling frequencies and analytical suites for each monitoring group. Appendix E summarizes how field quality assurance (QA)/quality control (QC) results are used and the types of corrective actions that may be taken to address exceedances of target measures for each QA/QC sample type. Appendix F assesses the reliability of water-quality data collected from specific monitoring-network wells. Appendix G presents geologic cross-sections of the watersheds.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with U.S. Department of Energy (DOE) policy.

1.1 Purpose

The Interim Plan will address monitoring to

- determine the fate and transport of known legacy-waste contaminants,
- detect the arrival of potential contaminants to groundwater from previous releases,
- evaluate efficacies of corrective-action remedies,
- support proposed corrective measures,
- meet groundwater discharge permit requirements, and
- meet the monitoring requirements of DOE Orders 436.1 and 458.1.

These objectives collectively assist the Laboratory in determining any potential adverse impacts to surface water and groundwater resulting from Laboratory operations.

In addition, monitoring produces data required to evaluate risk and to assess regulatory compliance. Although the Interim Plan does not specifically address how the data collected will be used in those evaluations, the design of the monitoring network is based on conceptual models of potential sources, hydrogeologic pathways, and receptors. The data collected are intended to be useful in meeting reporting requirements under the Consent Order.

This revised Interim Plan presents an increased focus of monitoring activities on area-specific monitoring groups and key analytes for TA-54, TA-21, MDA AB, MDA C, TA-16 260 Outfall, and the chromium investigation. Monitoring of alluvial wells and springs that show a history of nondetects, that are located near other springs being monitored, or that are located in outlying areas away from Laboratory operations will be discontinued under the new focused approach.

The scope of this focused monitoring approach includes the following key elements to ensure groundwater protection.

- *The spatial coverage of the current monitoring program will be maintained*. The monitoring footprint in perched-intermediate and regional wells at all monitoring groups is retained.
- *The selection of monitoring frequency and appropriate analytes will be tailored to each specific area.* The monitoring frequency for each monitoring group was selected based on the contamination status at each site, the rate of change in contaminant concentrations, the historical monitoring data, and the hydrogeological conditions governing contaminant fate and transport for the area.
- *The groundwater monitoring program will continue to be fully protective of the regional aquifer beneath the Pajarito Plateau and of water-supply wells.* Monitoring of key sentinel wells is maintained.
- *Monitoring of key alluvial monitoring wells and springs will continue.* The alluvial wells were selected at locations downgradient of ongoing Laboratory operations. Continued monitoring of these alluvial wells will enable detection of contaminant releases, should any occur.

Section 1.6 summarizes basic sets of analytical suites and frequencies for locations assigned to area-specific monitoring groups or to general surveillance monitoring in each watershed.

Updates to monitoring within each watershed or monitoring group, including changes in monitoring frequency, analytical suites, and monitoring locations, are based on the following:

- Summaries of contaminant frequency of detections (FDs) (Attachment B-1 in Appendix B on CD)
- Conceptual models in watershed investigation reports (IRs)
- Completed canyons investigations whose results show contributions to risk from surface water are low
- Reviews of existing analytical data and trends for individual watersheds
- Reviews of water-level data to identify wells that are consistently dry and are candidates for removal from the sampling plan (section 1.10)
- Changes to the monitoring-well networks over time, including the addition of newly installed monitoring wells, the rehabilitation and conversion of multiscreen wells, and the removal of wells recently plugged and abandoned or planned for plugging and abandonment in the near-term
- Monitoring objectives for the area-specific monitoring groups

1.2 Scope

The Interim Plan describes the objectives for monitoring, the locations of sampling stations, the frequency of sampling, the field measurements taken at each location, and the analytical suites included in the monitoring plan for each watershed or monitoring group.

Four occurrences of water are monitored in this plan:

- Base flow—persistent surface water that is maintained by precipitation, snowmelt, effluent, and other sources
- Alluvial groundwater—water within the alluvium in the bottom of the canyons
- Intermediate-perched groundwater—localized saturated zones within the unsaturated zone
- Regional groundwater—deep, laterally continuous groundwater beneath the Pajarito Plateau

Groundwater will be routinely monitored by collecting samples at wells and springs and by analyzing them for specific constituents. Groundwater monitoring refers to gathering data not only for water-quality analysis but also for water-level measurements. Water-level data are critical to understanding groundwater occurrence and movement and the responses of groundwater levels to recharge and to pumping of water-supply wells.

Surface water at the Laboratory is divided into the following three flow types:

- Base flow—persistent, but not necessarily perennial, stream flow. This stream flow is present for periods of weeks or longer. The water source may be effluent, springs, or shallow groundwater in canyons.
- Snowmelt—flowing water that is present because of melting snow. This type of water often may be present for several weeks or more (persistent) but in some years may not be present at all.
- Storm runoff—flowing water that is present in response to rainfall. These flow events are generally short-lived, with flows lasting from less than an hour to several days.

In some cases, depending on weather conditions, each flow type may be collected at a single location within a time span of a few days. At other times, the flow may represent a combination of these types.

Storm runoff and snowmelt monitoring is not addressed in this plan but rather through the National Pollutant Discharge Elimination System (NPDES) Individual Permit and under DOE Orders 436.1 and 458.1 for surveillance. Base flow (persistent water) and, in some cases, persistent flow derived from snowmelt are monitored under the Interim Plan.

Monitoring under the Interim Plan will take place in area-specific monitoring groups within seven major watershed groupings: Los Alamos Canyon/Pueblo Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, the combined watersheds of Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon. Monitoring outside the Laboratory boundary is conducted to collect baseline data in areas that have been affected by past Laboratory operations (e.g., Guaje and Rendija Canyons) or that have not been affected by Laboratory operations. To ensure water leaving the Laboratory boundaries does not pose an unacceptable risk, this plan also includes monitoring in areas off-site that have the potential to be impacted by the Laboratory (e.g., the Rio Grande and springs in White Rock Canyon). Figure 1.2-1 shows the areas included in this Interim Plan.

The Interim Plan is updated annually to incorporate new information collected during the previous year. Locations, analytes, and sampling frequencies will be evaluated and updated as appropriate to ensure adequate monitoring and to ensure monitoring objectives for the individual monitoring groups continue to be met. Information gained through characterization efforts, aquifer test results, water-level monitoring, network assessments, and water-quality data will be used to refine the monitoring plan for each monitoring group. In addition, the need for sampling of analytes previously eliminated from sampling in various monitoring groups will be reevaluated during the development of the annual updates to the Interim Plan.

1.3 Reporting

The data collected under this Interim Plan are submitted to NMED in periodic monitoring reports (PMRs) in accordance with Section IV.A.6 of the Consent Order and per subsequent agreements with NMED on the frequency of reporting. The data in reports submitted to NMED are independently maintained and are made available to the public in the Risk Analysis, Communication, Evaluation, and Reduction (RACER) database as the data are received from the analytical laboratory (available at http://racernm.com/). Subject to the protocol stipulated in the memorandum of understanding (MOU) regarding the release of monitoring data collected from locations on Pueblo of San Ildefonso lands.

The PMRs present groundwater and base-flow data and are submitted to NMED in accordance with Consent Order requirements. Each PMR includes all available watershed monitoring data, along with the previous three rounds of data. In addition, groundwater data collected by the Laboratory are reviewed monthly, and constituents exceeding any of the seven screening criteria described in the Consent Order, modified May 13, 2008, are reported monthly to the NMED Hazardous Waste Bureau.

1.4 Regulatory Context

This Interim Plan fulfills groundwater monitoring requirements of the Consent Order as described in section 1.0. In addition to the Consent Order, the Laboratory is required to perform groundwater monitoring to satisfy other regulatory requirements, as summarized below. The Laboratory has an integrated approach to monitoring groundwater, and many of the other regulatory requirements discussed below are fulfilled through the implementation of the monitoring performed under the Interim Plan.

1.4.1 New Mexico Water Quality Control Commission Regulations

Currently, the TA-46 Sanitary Wastewater Systems (SWWS) Plant operates under a groundwater discharge permit (discharge plan number DP-857) issued by NMED pursuant to 20.6.2 New Mexico Administrative Code (NMAC). Sampling locations, monitoring frequencies, and reporting requirements are specified in the NMED-approved DP-857, under which the Laboratory conducts quarterly sampling at two NPDES outfalls, the SWWS Plant reuse wet well, and CdBO-6, an alluvial monitoring well located in Cañada del Buey. Monitoring under DP-857 began when the SWWS Plant opened in 1993 and is expected to continue indefinitely, with appropriate modifications made as discharge conditions change over time. The plan was renewed in 1998, and a second request for plan renewal was submitted to the NMED in 2002.

1.4.2 DOE Environmental Protection Programs

Groundwater monitoring has been conducted in compliance with DOE orders related to environmental protection. DOE Orders 436.1 and 458.1 require an environmental management system at DOE facilities that includes surveillance groundwater monitoring and reporting. Surveillance monitoring has been conducted at the Laboratory since the 1970s under previous DOE orders, and the results are documented in annual reports. Currently, the Laboratory conducts groundwater-surveillance monitoring from wells located within the Laboratory boundary and at off-site locations. These wells include alluvial, perched-intermediate, and regional aquifer wells. Some of the off-site monitoring is performed under cooperative agreements with Los Alamos County, which owns and operates water-supply wells within and near the Laboratory, and with the City of Santa Fe. Additional monitoring is performed under an MOU among DOE, the Bureau of Indian Affairs, and the Pueblo of San Ildefonso. The results of surveillance monitoring are reported in annual environmental reports and the RACER database. The environmental reports contain descriptions of the surveillance monitoring network, key results and trends, and the QA/QC program.

1.4.3 Hazardous Waste Facility Permit

Section III.W of the Consent Order describes the integration of the current and any future Hazardous Waste Facility Permits (hereafter, the Permits) with the Consent Order. All corrective action for releases of hazardous waste or hazardous constituents required by Sections 3004(u), 3004 (v), and 3008(h) of the federal Resource Conservation and Recovery Act (RCRA); Sections 74-4-4(A)(5)(h) and (i), 74-4-4.2(B) and 7-7-10(E) of the Hazardous Waste Act (HWA); and the federal and state implementing regulations at 40 Code of Federal Regulations (CFR) Part 264, Subpart F and 20.6.2.3103 NMAC shall be conducted solely under the Consent Order, with the following four exceptions:

1. New releases of hazardous wastes or hazardous constituents from operating units at the Laboratory;
2. Closure and postclosure care requirements as they apply to operating units at the Laboratory;
3. Implementation of controls, including long-term monitoring, for any solid waste management units (SWMUs) and areas of concern (AOCs) on the Permit’s Corrective Action Complete with Controls list; and
4. Any releases of hazardous wastes or hazardous constituents that occur after the termination of the Consent Order.

Groundwater-monitoring requirements for SWMUs, AOCs, and regulated units that satisfy the alternative requirements provisions in 40 CFR 264.90(a)(2) are addressed under the groundwater-monitoring provisions of the Consent Order, including implementation of the Interim Plan.

1.5 Integration of Groundwater Monitoring at the Laboratory

All groundwater monitoring under the Interim Plan is conducted as an integrated activity that uses the same operating procedures, field sampling and analytical contracts, and data-management systems. For chemical analysis of water samples, the Laboratory uses commonly accepted analytical methods called for under federal regulations (such as the Clean Water Act) and approved by the U.S. Environmental Protection Agency (EPA). The Laboratory is responsible for obtaining analytical services that support monitoring activities. Samples for laboratory analysis are submitted to accredited contract laboratories. The analytical laboratory statement of work provides contract laboratories the general QA guidelines and includes specific requirements and guidelines for analyzing water samples. The contract laboratories are required to establish method detection limits (MDLs) and practical quantitation limits (PQLs) for target analytes.

Appendix C includes summaries of the procedures followed to measure water levels and collect water samples (sections C-1.0 and C-2.0) and to measure field parameters (section C-3.0). Field procedures follow guidelines from USGS water sample collection methods and industrial standards common to environmental sample collection and field measurements. The analytical methods, PQLs, and applicable background or screening levels used for each analyte are listed in section C-4.0. The management of IDW is discussed in section C-5.0.

1.6 Approach to Monitoring Network Design

The interim nature of this monitoring plan reflects an evolving monitoring network at the Laboratory. The groundwater data collected under this plan are used for subsurface characterization, groundwater monitoring network evaluation, and support of corrective measures.

For the 2010 Interim Plan, monitoring groups were established to address monitoring requirements for locations within specific project areas (LANL 2010, 109830). These monitoring groups are shown in Plate 1 and include the following (the watersheds in which the monitoring area is located are given in parentheses):

- TA-21 (Los Alamos Canyon)
- TA-54 (Pajarito and Mortandad Canyons)
- MDA C (Pajarito and Mortandad Canyons)
- Chromium investigation (Sandia and Mortandad Canyons)
- TA-16 260 Outfall (Pajarito and Water Canyons and Cañon de Valle)
- MDA AB (Ancho and Water Canyons)

Monitoring locations outside of the seven area-specific monitoring groups delineated above are included in a general surveillance monitoring group, which includes locations in all seven major watershed groupings (Los Alamos Canyon/Pueblo Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, the combined watersheds of Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon).

The locations, analytical suites, and frequency of monitoring for each monitoring group reflect the state of knowledge for a given project area, including what contaminants have been released and the nature and extent of the contaminants released. Much of the information underlying the design of the monitoring plan is presented in IRs and is supported by the FD tables in Appendix B of this Interim Plan. Recommendations for the analytical suites for each watershed and locations within the watershed were determined by evaluating past Laboratory operations, investigation-derived information, and monitoring results. For this Interim Plan, updates to monitoring are made for all monitoring groups based on the adequacy of data to support the modifications to suite and the frequency. Data from 2005 to 2010 were screened to compare with one-half the lowest applicable standard (see Table 1.6-1). This period of record was selected for this version of the plan to provide a sufficiently robust data set to evaluate FD and time-series trends, if applicable. The analytical data screening results are summarized in tables in Attachment B-1 of Appendix B (on CD).

Table 1.6-2 summarizes analytical suites, and sampling frequencies for each type of sampling location (e.g., base flow, alluvial, intermediate, regional, or springs) within each area-specific monitoring group. Table 1.6-3 summarizes the analytical suites and sampling frequencies for general surveillance monitoring locations (locations not assigned to area-specific monitoring groups). In this sampling table, the northern locations (including Los Alamos/Pueblo, Sandia, and Mortandad Canyons) and the southern locations (including Pajarito, Water/Cañon de Valle, Frijoles, Ancho, and Chaquehui Canyons) are distinguished because the analytical suites differ, based primarily on the presence of high explosives (HE) in the southern canyons and their absence in the northern canyons. The analytical suites and frequencies are tailored to each watershed and sampling location based on the adequacy of the data record, the status of investigations and maturity of the conceptual model, the nature of watershed contaminant sources, and the history of detections, as documented in more detail in sections 2 to 8. Analytical suites assigned to existing (pre-2010) wells within watersheds and investigation areas are based on the results of applicable IRs and a review of ongoing monitoring data, as presented in the statistical summaries of detections in Attachment B-1 of Appendix B (on CD). The assignment of specific analytical suites to a well also reflects data needs for pending corrective measures evaluations (CMEs). Tables 1.6-2 and 1.6-3 also list characterization suites and sampling frequencies for newly installed wells (wells installed on or after October 1, 2010). New wells will be sampled for at least four rounds for the monitoring-group specific characterization suites for new wells presented in Tables 1.6-2 and 1.6-3.

Exceptions to the analytical suites and sampling frequencies presented in Tables 1.6-2 and 1.6-3 occur in some cases. These exceptions may be the result of a number of factors such as additional regulatory or permit requirements and sampling commitments outlined in the MOU with the Pueblo of San Ildefonso.

Exceptions to the default analytical suites and sampling frequencies may also be made for wells affected by residual drilling or construction products, recently rehabilitated wells, and other wells known to produce nonrepresentative water-quality data or for which the reliability of the data has not yet been established or may be questioned (Appendix F). Additionally, some wells may be monitored for a limited set of constituents tailored to address monitoring objectives or performance issues with the well.

Appendix D summarizes the sampling frequencies and analytical suites for each monitoring group and explains how the monitoring objectives are protective of groundwater.

1.7 Data-Screening Process

This section describes the process for screening the monitoring data. The purpose of the screening is to identify analytical parameters that guide the assignment of analytical suites and monitoring frequencies in each monitoring group.

The results of the screening for all locations in each monitoring group are used to update the monitoring for that group. The results of the data-screening process and statistical summaries are presented in Appendix B. The data-screening process consists of compiling the water-quality data set, determining detection status, screening the data against applicable standards, and producing summary statistics to identify constituents of potential concern in each watershed. Table B1-1 (groundwater) and Table B1-2 (surface water) in Attachment B-1 of Appendix B (on CD) present summary statistics for each water type and analytical suites based on data compiled for individual locations in Table B1-3 (groundwater) and Table B1-4 (surface water).

Table 1.6-1 presents the regulatory standards for the various water sample types by screening category. The data results were screened against the lowest applicable regulatory standard or risk-based value in the tables in Attachment B-1 of Appendix B. The standards that apply depend on the type of field preparation conducted during collection (filtered or unfiltered) and the type of the water (i.e., groundwater or persistent surface water). Each combination of water type/field preparation is referred to as a screening category. The standards for filtered samples are those applicable to the dissolved fraction, and standards for unfiltered samples are those applicable to the total concentration in nonfiltered samples. The terms “nonfiltered” and “unfiltered” are used interchangeably in this document.

For screening purposes, laboratory and field QC samples were removed from the statistical analysis. The detection status for an analytical result was established using the combined set of laboratory-assigned validation qualifiers and reason codes assigned during data validation (Appendix E).

The screening tables presented in Attachment B-1 of Appendix B (on CD) were used to identify constituents of potential concern and to optimize the monitoring strategy for each watershed. Groundwater and base-flow data from 2005 to 2010 are screened against one-half the lowest applicable regulatory standards or other risk-based screening levels (presented in Table 1.6-1) and against appropriate groundwater background values, if available. The screening tables are organized by contaminant type in each water type (e.g., spring, perennial base flow, regional aquifer) within each monitoring group.

The screening tables in Attachment B-1 include summary information such as the total number of samples collected for each analyte; the numbers of detections and nondetects; the minimum, mean, and maximum values for detections of each analyte; and comparisons with background values (if available) and with regulatory standards. The tables also list sampling locations where the lowest applicable regulatory standards are exceeded. Additional details regarding the screening tables are presented in the introduction to Appendix B.

1.8 Sampling Frequency and Schedule

The Interim Plan proposes monitoring frequencies for each monitoring group as described in the sampling tables in sections 2 through 8. For newly installed wells (i.e., those installed on or after October 1, 2010), the monitoring frequency and characterization suite are quarterly or semiannually for target analyte (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), tritium, general inorganics, and perchlorate. Less mobile constituents for which there is no reasonable migration scenario to the regional aquifer (including pesticides, polychlorinated biphenyls [PCBs], and dioxins/furans) are no longer sampled in new deep wells completed in perched-intermediate groundwater or in the regional aquifer. HE compounds may be sampled quarterly or semiannually if known or suspected to be present.

Monitoring locations that are being used or are candidates for the determination of background water quality for the regional and perched-intermediate aquifers are indicated as such in the sampling table for each monitoring group.

The MY for the Interim Plan is from October 2011 to September 2012. This revision of the Interim Plan will supplement the first quarter implemented under the initial 2011 Interim Plan and will be in effect starting January 1, 2012. Table 1.8-1 presents a proposed sampling schedule. Following submittal of this Interim Plan to NMED, a finalized sampling schedule for each monitoring group or watershed will be established to ensure the monitoring frequency is met during the implementation year of the plan. A PMR for the periodic monitoring event conducted during first quarter of MY2012 (sampling conducted from October to December 2011) will be submitted on May 31, 2012. A PMR for second quarter of MY2012 (sampling conducted from January to March 2012) will be submitted on August 31, 2012. A PMR for the third quarter MY2012 (sampling conducted from April to June 2012) will be submitted on November 30, 2012. A PMR for the fourth quarter MY2012 (sampling conducted from July to September 2012) will be submitted on February 28, 2013.

The Consent Order requires all monitoring wells within a watershed be sampled within 21 d of the start of the groundwater sampling event. For the 2011 Interim Plan, monitoring groups for project areas have effectively replaced the watersheds, and monitoring for the individual monitoring groups, with the exception of the general surveillance monitoring group, will be completed within 21 d. Monitoring of the White Rock Canyon general surveillance group will be completed within 21 d. The other general surveillance locations will be monitored in conjunction with other monitoring activities at nearby locations or watersheds.

1.9 Water-Level Monitoring

The majority of monitoring wells sampled are equipped with pressure transducers to measure and record water levels to aid in understanding the hydrologic system. Pressure transducers are typically set to record on an hourly basis. Manual water-level measurements are also collected on a regular basis to verify the pressure transducer data.

The water-level data collected using the automated pressure transducers address the requirement of Section IX.B.2.h.i of the Consent Order to measure groundwater levels in all wells in a given watershed within 24 h. These data are available for any 24-h period and, therefore, meet the requirement for these measurements to be completed across all watersheds within 14 d of the commencement of the specified water-level measuring event as required by the Consent Order. Water levels are monitored in a number of wells and/or well screens that are not sampled under the Interim Plan to collect data to develop and validate the conceptual models (Table 1.9-1). Groundwater levels are also monitored in Los Alamos County water-supply wells in cooperation with Los Alamos County utilities personnel and in the Buckman Well Field in cooperation with the City of Santa Fe.

1.10 Wells That Are Historically Dry

Wells that are historically dry are generally no longer monitored for water levels, except for a few wells in key locations (Table 1.9-1). Wells that intermittently show water (in response to large snowmelt years or precipitation events) may continue to be monitored for water levels using transducers and will be sampled if sufficient water is present during their respective watershed’s sampling campaign. New wells that are dry may be retained in the monitoring plan to evaluate potential wetting responses and temporal changes in water levels.

2.0 TA-21 MONITORING GROUP

2.1 Introduction

The TA-21 monitoring group is located in and around TA-21 and is primarily located in upper Los Alamos Canyon (Figure 2.1-1). The group includes monitoring wells completed in the perched-intermediate groundwater and in the regional aquifer.

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 historically 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.

2.2 Background

The occurrence of surface water and alluvial, perched-intermediate, and regional groundwater in Los Alamos Canyon is discussed in detail in section 7.2 of the Los Alamos and Pueblo Canyons IR (LANL 2004, 087390).

In upper Los Alamos Canyon, perennial flow originates from springs and interflow through hillslope soils. The downgradient extent of perennial flow varies but generally terminates in the upper portions of Los Alamos Canyon west of TA-41. The remainder of upper Los Alamos Canyon down to the confluence with Pueblo Canyon is characterized by intermittent surface water flow that is seasonally dependent. Within the vicinity of TA-21, surface water occurs predominantly as ephemeral flow in Los Alamos and DP Canyons. Ephemeral surface water flows generally occur during runoff associated with thunderstorms and snowmelt.

In the vicinity of TA-21, alluvial groundwater occurs in Los Alamos Canyon and in stretches of DP Canyon. DP Canyon is typical of other dry canyons (Birdsell et al. 2005, 092048) based on its small drainage area and low-elevation headwaters. However, it previously received effluent discharges operations at TA-21 [SWMU 21-011(k)]. It currently receives surface runoff from paved parking lots and roadways from within the Los Alamos townsite. These townsite runoff sources contribute to locally persistent alluvial groundwater beneath parts of the canyon floor, specifically the portion adjacent to TA-21. There, alluvial deposits are thin (approximately 2 m [6 ft]) and are periodically recharged by surface water flows that reach this part of the canyon. Surface water infiltrates the canyon bottom alluvial sediments until its downward movement is impeded by strata of lower permeability, typically welded tuff at the top of unit Qbt 2 of the Tshirege Member. Despite the episodic nature of surface water flow and thin nature of the alluvial deposits, transducer readings at alluvial well LAUZ-1 indicate the alluvium in this part of the canyon was continuously saturated from January 2008 to January 2010 (Koch and Schmeer 2010, 108926), suggesting the underlying welded tuffs are an effective perching horizon that inhibits deeper infiltration.

Appendix D of the Technical Area 21 Groundwater and Vadose-Zone Monitoring Well Network Evaluation and Recommendations report (LANL 2010, 109947) describes known occurrences of intermediate-perched water beneath Los Alamos and Pueblo Canyons. Perched-intermediate zones nearest TA-21 are shown on the geologic cross-sections presented in Appendix G.

Perched-intermediate groundwater beneath Los Alamos and Pueblo Canyons results from infiltration of surface water and alluvial groundwater derived from snowmelt and seasonal rainfall. Surface water in Pueblo Canyon was previously augmented by effluent released from the Pueblo Canyon wastewater treatment plant (WWTP) from 1951 to 1991 and the Central WWTP from 1947 to 1961. Perched-intermediate groundwater beneath lower Pueblo Canyon includes contributions of canyon-floor effluent infiltration from the Bayo WWTP that operated from 1963 to 2007 and the Los Alamos WWTP that began operations in 2007.

The most significant perched-intermediate groundwater in the vicinity of TA-21 occurs within the Guaje Pumice Bed and the underlying Puye Formation beneath Los Alamos Canyon. Near TA-21, saturated thicknesses for these occurrences range from about 9 ft at LADP-3 to more than 31 ft at LAOI-3.2a. The depth to perched-intermediate groundwater ranges from 124 ft to 746 ft. These perched groundwater occurrences are probably part of a larger integrated system that extends over 3.5 mi along the axis of Los Alamos Canyon from H-19 to LAOI-3.2 and LAOI-3.2a and may extend locally to the south (Appendix G).

Based on these observations, it appears an important control of intermediate-zone groundwater flow in the vicinity of TA-21 is the contact between the Guaje Pumice Bed and the underlying Puye Formation. Structure contours indicate the downdip direction for the base of the Guaje Pumice Bed is towards the south, southeast, and southwest in the vicinity of TA-21. The control exerted on groundwater flow by the Guaje Pumice Bed suggests that perched water beneath Los Alamos Canyon should move generally southward away from TA-21.

The occurrence of thicker perched-intermediate zones in the eastern part of Los Alamos Canyon may be the result of enhanced infiltration where the canyon floor is underlain by Cerros del Rio basalts rather than by the Bandelier Tuff. Because the Cerros del Rio basalt does not extend as far west as the developed portion of TA-21, it is unlikely the eastern perched zones of Los Alamos Canyon extend beneath the TA-21 area. No perched-intermediate groundwater has been encountered to date during drilling on DP Mesa.

The regional aquifer includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer generally follows the gradient of the water table. The deep portion of the regional aquifer is predominantly under confined conditions that are affected by Pajarito Plateau water-supply pumping.

In the vicinity of TA-21, the upper surface of the regional aquifer is located in the Puye Formation and in the Santa Fe Group. The depths to water range from 707 ft to 1159 ft below ground surface (bgs) (Koch and Schmeer 2011, 201566). The regional aquifer beneath the east end of DP Mesa occurs at a depth of 1159 ft bgs, based on water levels measured in well R-6. Shallow regional groundwater in the vicinity of TA-21 generally flows to the east-northeast.

Contaminant Sources and Distributions

Primary sources of contaminants in the vicinity of the TA-21 monitoring group include SWMU 21-011(k), the adsorption beds and disposal shafts at MDA T, DP West, and waste lines and sumps. Other potential sources include DP East and a diesel spill.

Mobile contaminants, such as tritium, nitrate, and perchlorate, released at the SWMU 21-011(k) outfall have dispersed down DP and Los Alamos Canyons by surface water and alluvial groundwater. They are present in perched-intermediate groundwater near the confluence of DP and Los Alamos Canyons (at wells R-6i, LAOI-3.2, and LAOI-3.2a), farther down Los Alamos Canyon (at LAOI-7 and R-9i), and beneath Mesita de Los Alamos (at R-53i).

The lower reach of DP Canyon is the likely infiltration location for mobile contaminants such as tritium, nitrate, and perchlorate that are detected in perched groundwater at R-6i, LAOI-3.2, and LAOI-3.2a. Infiltration at the confluence with DP Canyon (near wells LAOI-3.2/LAOI-3.2a) may be further enhanced by surface water runoff and alluvial groundwater in Los Alamos Canyon, contributing to the deeper, perched-intermediate zones observed beneath the confluence of the two canyons. The zones of perched-intermediate groundwater occur within the Guaje Pumice Bed and the underlying Puye Formation near the confluence of the two canyons.

Contaminant concentrations are at background levels in regional groundwater monitoring wells in the near vicinity of TA-21 (e.g., R-6, R-8, and R-64), suggesting deep infiltration through the vadose zone, including migration from perched groundwater, does not reach the regional aquifer near TA-21. This observation is also supported by the absence of tritium in the regional screen in R-7, although the absence of nitrate and perchlorate at this location is not conclusive because of reducing conditions in the screened interval that may be attributed to residual organic drilling products. The regional aquifer at Test Well (TW) 3 shows levels of contamination above background, but this may be related to leakage around the well casing from the absence of annular seal in this older well. The well is scheduled to be plugged and abandoned. Tritium and perchlorate are slightly elevated in the regional aquifer at R-9, which is located farther down Los Alamos Canyon. These far-field contaminants may have originated at SWMU 21-011(k).

2.3 Monitoring Objectives

The monitoring objectives for the TA-21 monitoring group presented in this Interim Plan are based in part on the results and conclusions presented in the Los Alamos and Pueblo Canyons IR (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).

Sampling over the last few years has generated a substantial data set from perched-intermediate and regional groundwater wells located in and next to Los Alamos Canyon. Data from these wells indicate the importance of lateral migration of perched-intermediate groundwater and regional groundwater flow directions. This information can lead to a groundwater monitoring domain that may extend beyond the footprint of a watershed where the initial release occurred.

Monitoring for TA-21 is focused on intermediate-perched and regional wells surrounding the TA-21 area that monitor for potential releases from mesa-top sites and the fate of mobile constituents historically released into DP Canyon from SWMU 21-011(k). The key constituents detected in nearby perched-intermediate and regional groundwater wells include nitrate, perchlorate, and tritium. Base-flow and alluvial-groundwater wells near and downgradient of TA-21 are not part of the TA-21 monitoring group because the source(s) of constituents detected in these wells is terminated or controlled and residual concentrations are stable, declining, or no longer present.

2.4 Scope of Activities

Active monitoring locations in the TA-21 monitoring group include intermediate-perched groundwater wells and regional groundwater wells, which are shown in Figure 2.1-1. All the monitoring locations are in the Los Alamos Canyon/Pueblo Canyon watershed.

Table 2.4-1 presents sampling locations, the rationale for these locations, analytical suites, and frequencies for the TA-21 monitoring group. Analytical suites and frequencies assigned to individual locations listed in Table 2.4-1 generally follow the high-level monitoring design presented in Table 1.6-2 for the TA-21 monitoring group. These analytical suites and frequencies are based on the results of applicable IRs and a review of ongoing monitoring data, such as the statistical summaries for locations in the TA-21 monitoring group provided in the FD screening tables in Attachment B-1 of Appendix B (on CD).

Exceptions to the analytical suites and sampling frequencies presented in Table 1.6-2 may occur for some locations listed in Table 2.4-1. The majority of the wells in the TA-21 monitoring group are sampled annually. New wells R-64 (completed July 11, 2011) and R-66 (following installation of its sampling system) will be sampled quarterly. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

3.0 CHROMIUM INVESTIGATION MONITORING GROUP

3.1 Introduction

The chromium investigation monitoring group is located in Sandia and Mortandad Canyons (Figure 3.1-1). Monitoring focuses on the characterization and fate and transport of chromium contamination in perched-intermediate groundwater and within the regional aquifer. The distribution of 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 volumes were considerably reduced in 2010 and 2011 because process changes at the RLWTF have significantly reduced discharges to the outfall.

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 San Ildefonso Pueblo. Sandia Canyon empties into the Rio Grande in White Rock Canyon at an elevation of 5450 ft. The area of Sandia Canyon watershed is approximately 5.5 mi^2. The head of the canyon is located on the Pajarito Plateau at TA-03. Perennial stream flow and saturated alluvial aquifer 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 wastewater and cooling tower effluent discharge. The only known perennial spring in the watershed (Sandia Spring) is located in lower Sandia Canyon near the Rio Grande. TAs 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 AOCs are located within these TAs.

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 (Figure 1.2-1). 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 Pueblo of San Ildefonso 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. Pueblo of San Ildefonso lies immediately next to a portion of the Laboratory's eastern boundary and includes the eastern end of Mortandad Canyon. The Mortandad Canyon watershed contains several tributary canyons that have received contaminants released during Laboratory operations. The most prominent tributary canyons include Ten Site Canyon, Pratt Canyon, Effluent Canyon, and Cañada del Buey.

3.2 Background

Sources of surface water in the Sandia watershed are currently dominated by effluent releases. Effluent water releases to Sandia Canyon have occurred since the early 1950s and continue today, with the primary source being treated sanitary wastewater and steam plant discharges at Outfall 001 and lesser sources being cooling tower blowdown. Data from 2007 and 2008 indicate the NPDES outfalls contribute approximately 75% of the total surface water flow in Sandia Canyon, with stormwater runoff and snowmelt contributing the remainder (LANL 2008, 102996, Appendix C).

The long-term discharges and runoff support a wetland near the head of Sandia Canyon. Persistent surface flow occurs through the wetland and into the narrow, bedrock portion of the upper canyon. Surface water flows past gage E124 typically only during times of high alluvial groundwater levels, increased effluent volume, or during stormwater runoff events.

Surface water in Mortandad Canyon is ephemeral and occurs infrequently in lower Mortandad Canyon. Effluent releases from the RLWTF have historically supported surface water in middle Mortandad Canyon, but those contributions are currently minimal. The lower canyon is characterized by a broad flat canyon floor with an indistinct drainage channel. It contains thick alluvial deposits (up to 30 m [100 ft]) that rapidly accommodate the rare surface water flows that reach this part of the canyon. Surface water is rarely observed below the confluence with Ten Site Canyon.

Alluvial groundwater in Sandia Canyon is recharged daily by surface-water flow, largely supplied by effluent from Outfall 001 and periodically by stormwater. This groundwater generally accumulates in the lower part of the alluvial deposits that fill the canyon bottom, most often perching on or within shallow bedrock units. The alluvial groundwater body extends farther downcanyon (roughly more than 1 km [0.6 mi] farther east) than do the daily stream-flow events. Alluvial saturation occurs approximately between alluvial wells SCA-2 and well SCA-5, with the most persistent perched alluvial groundwater occurring between alluvial wells SCA-2 and SCA-4.

In Mortandad Canyon (LANL 2006, 094161), alluvial groundwater storage is limited in the upper reaches but increases downcanyon in wider, thicker alluvial deposits (LANL 2006, 094161). Small outfall and runoff sources in upper Effluent Canyon create localized areas of surface water and possibly minor alluvial groundwater. The extent of alluvial saturation in Mortandad Canyon is historically variable and depends primarily on variations in runoff and effluent volume; the extent has decreased recently with the decrease of effluent from RLWTF.

A zone of perched-intermediate groundwater occurs within the Puye Formation on top of the Cerros del Rio basalt between well SCI-1 and borehole SCC-4, where it ranged from approximately 1 ft to 25 ft thick, and generally thinned to the west. This perched zone is probably recharged by percolation of alluvial groundwater through the underlying bedrock units before perching on top of the basalt. The perching layer for this perched-intermediate groundwater is the top of the Cerros del Rio basalt. A local depression occurs in the upper basalt surface in the vicinity of nearby well SCI-2, which may control the accumulation of perched water in this area. The top of the Cerros del Rio basalt also acts as a perching horizon at perched-intermediate wells MCOI-4 and MCOBT-4.4 in Mortandad Canyon, indicating this contact has favorable characteristics for perching groundwater over a wide area.

A second perched-intermediate zone is penetrated by well SCI-2 within fractured lavas and interflow breccias in the lower part of the Cerros del Rio basalt. The thickness of the perched zone is uncertain but ranges between 45 ft and 100 ft. The lava flows hosting the perched groundwater at well SCI-2 were deposited over a south to south-southeast dipping surface that developed on top of the Puye Formation. The nature of the perching horizon at the base of these basalts is poorly understood but may include relatively impermeable sedimentary rock of the Puye Formation and clay altered flow-base volcanic sediment at the base of the Cerros del Rio basalt that occurs at a depth of 629 ft (LANL 2009, 105296).

Lack of perched water in the Cerros del Rio basalt at wells R-28 and R-42 in Mortandad Canyon may indicate that the perched groundwater drained from the basalts and infiltrated the underlying Puye Formation, eventually reaching the regional aquifer in the area between wells SCI-2 and R-28/R-42.

During drilling of well R-10a, intermediate-perched groundwater was encountered between 330 ft and 370 ft depth in silts and arkosic sands sandwiched between thick massive lavas of the Cerros del Rio basalt. The water level in this zone was 304 ft, indicating the groundwater was confined. Well R-10a and its companion well R-10 were completed in the regional aquifer. However, perched-intermediate groundwater was not encountered at regional wells R-11, R-35a, R-35b, R-36, R-28, R-44, or R-45, indicating that the perched zones at wells SCI-1 and SCI-2 are not connected with those observed in R-12 and R-10/10a. The inferred connection between the perched-intermediate systems at wells R-10/10a and R-12 is based on their similar settings within the Cerros del Rio basalt, their similar groundwater elevations, and their relatively close proximity.

The regional aquifer beneath Sandia Canyon (and canyons to the north and south) includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer generally follows the gradient of the water table. Groundwater flow and water levels within the deeper portion of the regional aquifer are impacted by water-supply pumping, with the largest fluctuations in water levels observed at well R-35a, located close to water supply well PM-3.

In the vicinity of the chromium investigation monitoring group, the water table is located in the Puye Formation and in the Santa Fe Group.

Contaminant Sources and Distributions

Chromium concentrations exceed NMED groundwater standards and EPA maximum contaminant levels (MCLs) in the regional aquifer at wells R-28, R-42, and R-50 located in Mortandad Canyon. Other constituents observed above background in 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 (hereafter, the Sandia Canyon IR) (LANL 2009, 107453). The Sandia Canyon IR presents the results of all the chromium and related studies conducted to date to address the nature and extent and the fate and transport of chromium and other contaminants originating in the Sandia Canyon watershed.

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, perched-intermediate and regional wells beneath Mortandad Canyon are included in the chromium investigation monitoring group. Other sources of contamination beneath Sandia and Mortandad Canyons are from Mortandad Canyon sources, particularly historical releases from the RLWTF outfall. Lateral migration from Los Alamos Canyon sources appears to also be detected in the chromium monitoring group. These sources and the migration pathways are described in the Sandia Canyon IR (LANL 2009, 107453).

3.3 Monitoring Objectives

The objective of the chromium investigation monitoring group is to further refine the nature and extent of contamination originating from various sources principally within Sandia and Mortandad Canyons, and to monitor the fate and transport of observed contaminants. For the past 6 yr, the monitoring in and beneath Sandia Canyon and adjacent canyons has focused on acquiring a fundamental understanding of the nature and extent of contaminants originating in the Sandia Canyon watershed, with an emphasis on chromium contamination because its concentration exceeds groundwater standards in the regional aquifer. This work has been coupled with sediment and biota investigations to refine the conceptual model for the fate and transport of contaminants. Several new wells have also been installed and have been undergoing initial characterization monitoring on a quarterly basis.

Base-flow locations and alluvial wells in Sandia Canyon are excluded from the chromium monitoring group because the primary contaminants of concern are at low and very stable concentrations in these media (LANL 2009, 107453). In Mortandad Canyon, contaminants in the surface water and alluvial groundwater have shown a marked decrease in concentration as a result of improvements in the treatment processes at the TA-50 RLWTF (see Figures 7.2-17, 7.2-18, and 7.2-25 in the Mortandad Canyon IR [LANL 2006, 094161]). The steadily decreasing trend of the contaminant concentrations in the surface water and alluvial groundwater supports inclusion of the locations within the general surveillance monitoring group (section 8.0). These data should provide sufficient information to continue verifying the decreasing trends in contaminant concentrations in alluvial groundwater.

Perched-intermediate and regional wells in Mortandad Canyon are included in the chromium investigation monitoring group because they are located along the contaminant-transport pathway that includes the southerly diversion of groundwater within the vadose zone beneath Sandia and Mortandad Canyons. The predominant contaminants monitored in this group of wells include chromium, other metals, nitrate, perchlorate, 1,4-dioxane, and tritium. The monitoring recommendations for perched-intermediate and regional groundwater beneath Mortandad Canyon reflect the updated conceptual model for these zones as presented in the Sandia Canyon IR (LANL 2009, 107453).

3.4 Scope of Activities

Active monitoring locations in the chromium investigation monitoring group include perched-intermediate and regional aquifer wells, which are shown in Figure 3.1-1. The monitoring group includes locations in Sandia Canyon as well as in Mortandad Canyon.

Table 3.4-1 presents sampling locations, the rationale for these locations, analytical suites, and monitoring frequencies. Analytical suites and frequencies assigned to individual locations in Table 3.4-1 generally follow the high-level monitoring design presented in Table 1.6-2 for the chromium investigation monitoring group. These analytical suites and frequencies are based on the results of applicable IRs and a review of ongoing monitoring data, such as the statistical summaries for locations in the Sandia and Mortandad Canyon watersheds provided in the FD screening tables in Attachment B-1 of Appendix B (on CD).

Following submittal of the Sandia Canyon IR (LANL 2009, 107453), more intensive monitoring is now focused on the perched-intermediate and regional groundwater, with an emphasis on chromium and general inorganic chemicals (particularly nitrate), as presented in Table 1.6-2. The sampling frequency for the wells in the chromium monitoring group is based primarily on the chromium concentrations compared with groundwater standards. Wells with concentrations exceeding standards are sampled quarterly, well with concentrations above background levels but below standards are sampled semiannually, and wells with concentrations at background levels are sampled annually. New well R-62 will be sampled quarterly after the sampling system is installed. Exceptions to the analytical suites and sampling frequencies presented in Table 1.6-2 may occur for some locations listed in Table 3.4-1. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

4.0 MDA C MONITORING GROUP

4.1 Introduction

The MDA C monitoring group includes nearby regional monitoring wells on the mesa top and in Mortandad Canyon (Figure 4.1-1). MDA C is located on Mesita del Buey in TA-50, at the head of Ten Site Canyon. TA-50 is bounded on the north by Effluent and Mortandad Canyons, on the east by the upper reaches of Ten Site Canyon, on the south by Twomile Canyon, and on the west by TA-55.

MDA C 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 seven 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.

4.2 Background

MDA C is located on a mesa top, so no shallow alluvial groundwater is present in the immediate vicinity. The nearest surface water is found in Effluent Canyon to the north and in Pajarito Canyon and Twomile Canyon to the south.

No perched groundwater or intermediate-depth saturated horizons were encountered during previous investigations at MDA C (LANL 1998, 059599; LANL 2005, 091493, p. 6) or in any of the boreholes drilled during the Phase III investigation at MDA C (LANL 2011, 204370). No perched groundwater was encountered during the drilling of regional wells R-46 or R-60.

Regional monitoring wells R-46 and R-60 are located downgradient of MDA C (Figure 4.1-1) (LANL 2009, 105592; LANL 2011, 111798). The upper surface of the regional aquifer is located within the lower Puye Formation or the upper pumiceous deposits of the Santa Fe Group, and the depths to water range from approximately 1320 ft to 1330 ft bgs (Koch and Schmeer 2011, 201566). Near MDA C, the direction of shallow groundwater flow in the regional aquifer is to the east-southeast.

Contaminant Sources and Distributions

Vapor-phase 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 (TCE), tetrachloroethene, and tritium. There is no evidence of groundwater contamination in the regional aquifer (Attachment B-1 of Appendix B of this report). MDA C is located on a mesa top above thick, unsaturated units of the Bandelier Tuff, and therefore present-day aqueous-phase transport is generally believed to be minimal.

4.3 Monitoring Objectives

Monitoring objectives for the MDA C monitoring group are to supplement existing vadose zone pore-gas monitoring to refine and nature and extent of contamination and assess the fate and transport of the current vadose zone contaminant distribution. The monitoring will also support upcoming CME activities.

4.4 Scope of Activities

The MDA C Area monitoring group consists of three regional groundwater monitoring wells, R-14, R-46, and R-60, as shown in Figure 4.1-1. Table 4.4-1 presents sampling locations, the rationale for these locations, analytical suites, and frequencies for the MDA C monitoring group. Analytical suites and frequencies assigned to individual locations listed in Table 4.4-1 generally follow the high-level monitoring design presented in Table 1.6-2 for the MDA C monitoring group. These analytical suites and frequencies are based on the results of applicable IRs and a review of ongoing monitoring data, such as the statistical summaries for locations in the MDA C monitoring group provided in the FD screening tables in Attachment B-1 of Appendix B (on CD).

Exceptions to the analytical suites and sampling frequencies presented in Table 1.6-2 may occur for some locations listed in Table 4.4-1. The wells in the MDA C monitoring group are sampled semiannually. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

5.0 TA-54 MONITORING GROUP

5.1 Introduction

At TA-54, groundwater monitoring is being conducted to support both the corrective measures process for SWMUs and AOCs (particularly the MDAs G, H, and L) under the Consent Order and in support of the RCRA permit. The TA-54 monitoring group was established to address the monitoring requirements for all portions and aspects of TA-54 (Figure 5.1-1). The TA-54 monitoring group includes both perched-intermediate and regional wells in the near vicinity. Other downgradient 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 discussed in this section.

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. MDAs H and J are located approximately 500 ft and 1000 ft (150 m and 305 m) southeast of the transfer facility, respectively. MDA L is located approximately 1 mi (1.6 km) southeast of the transfer facility. MDA G subsurface units are located within Area G approximately 0.5 mi (0.8 km) southeast of MDA L.

Mesita del Buey is a 100-ft to 140-ft-high finger-shaped mesa that trends southeast. The elevation of Mesita del Buey ranges from 6750 ft to 6670 ft at Area G. The mesa is approximately 500 ft wide and is bounded by the basin of Cañada del Buey (450 ft to the north) and the basin of Pajarito Canyon (360 ft to the south) (Figure 5.1-1).

5.2 Background

The TA-54 monitoring group is located predominantly in the Pajarito Canyon watershed, and the occurrence of surface water, alluvial groundwater, and perched-intermediate and regional groundwater is discussed in detail in section 7.2 of the Pajarito Canyon IR (LANL 2009, 106939).

Sources of surface water in the Pajarito watershed currently include snowmelt, stormwater runoff, and discharges at several springs. Perennial surface water flow within the TA-54 monitoring group area occurs in within Pajarito Canyon.

The primary alluvial groundwater body in Pajarito Canyon extends east from below the confluence with Twomile Canyon to approximately regional well R-23, a distance of 4.4 mi (7 km). Spatially restricted bodies of alluvial groundwater are also present west of the Twomile Canyon confluence and extend upcanyon to springs in the south fork of Pajarito Canyon (Upper Starmer Spring) and Pajarito Canyon above the south fork confluence (Homestead Spring). The alluvial groundwater is recharged by stream flow and some local precipitation. It accumulates in the alluvial deposits that fill the canyon bottom, often perching on shallow bedrock units. The alluvial groundwater extends farther down canyon than does stream flow because some downcanyon, lateral flow occurs within the alluvium. Alluvial groundwater acts as a source of infiltrating water into the deeper tuff units and transiently into the Cerros del Rio basalt, which is very near the surface at well R-23. The extent of this groundwater helps define deeper infiltration zones within the canyon. Overall, lateral flow within the alluvium and deeper infiltration of alluvial groundwater into underlying bedrock may provide a driving force for subsurface transport of soluble contaminants along the length of the canyon and into the deeper subsurface.

Perched-intermediate groundwater occurs in a variety of settings beneath the Pajarito watershed. Occurrences are known from deep groundwater investigations and from more localized SWMU investigations. Intermediate-perched horizons are present in the Bandelier Tuff in the upper portion of the watershed and in the Cerro Toledo interval, Puye Formation, dacitic lavas, and Cerros del Rio lavas in the middle and lower portions of Pajarito Canyon. The location and nature of most of these occurrences are consistent with, and indicative of, known or suspected canyon reaches with higher infiltration, such as nearby wells R-17 and R-23. At well R-37, relic regional groundwater may have become disconnected or stranded from the current regional groundwater as drawdown associated with water-supply production has occurred. There is no indication that the perched-intermediate zones are laterally continuous over large areas.

In the vicinity of TA-54, perched-intermediate groundwater occurs in wells R-55, R-55i and R-23/R-23i (LANL 2003, 079601; Kleinfelder 2006, 092495; LANL 2011, 111611) at depths ranging from 406 ft to 498 ft bgs. Perched-intermediate groundwater also occurs in wells R-40/40i and R-37 (LANL 2009, 106432; LANL 2009, 107116) at depths ranging from 639 ft to 909 ft. This water is thought to be localized beneath the canyon floor, and to result from localized canyon floor infiltration.

The regional aquifer in the vicinity of TA-54 includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer is generally eastward beneath the western section of Pajarito watershed and southeastward beneath the eastern section of Pajarito watershed. In the vicinity of TA-54, the upper surface of the regional aquifer is located within the Cerros del Rio basalts and the underlying sediments of the Puye Formation, and the depths to water range from 785 to 1020 ft bgs (Koch and Schmeer 2011, 201566).

Groundwater flow in the upper part of the regional aquifer beneath TA-54 appears to be substantially impacted by the Cerros del Rio lavas (LANL 2010, 111362). These lavas are more than 150 ft thick beneath the regional water table. Groundwater flow in the regional aquifer beneath TA-54 is impacted by (1) water-supply pumping, (2) the local-scale infiltration recharge along Pajarito Canyon, (3) the lateral propagation of large-scale mountain-front aquifer recharge occurring to the west of TA-54, and (4) the discharge of the regional aquifer to the southwest towards the White Rock Canyon springs and the Rio Grande.

Contaminant Sources and Distributions

Pore-gas monitoring data show that vapor-phase transport of contaminants occurs in the upper portion of the unsaturated zone, and that vapor-phase VOCs are present beneath MDAs G and L. The primary contaminants that have transported in the vapor phase at TA-54 are 1,1,1-trichloroethane (1,1,1,-TCA); TCE; Freon-113; and tritium (LANL 2005, 090513; LANL 2006, 091888; LANL 2007, 096409).

Data from the groundwater monitoring network around TA-54 show sporadic detections of a variety of contaminants including, most notably, several VOCs. The temporal and spatial nature of the occurrences do 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 perched-intermediate and regional groundwater at TA-54 are presented in the CMEs for MDAs G, H, and L (LANL 2011, 205756; LANL 2011, 206319; LANL 2011, 206324).

5.3 Monitoring Objectives

Monitoring at TA-54 focuses on perched-intermediate and regional groundwater zones beneath TA-54 (Figure 5.1-1). The monitoring suite for perched-intermediate and regional groundwater addresses RCRA monitoring requirements and also reflects the data collected to date from wells in the TA-54 network.

Characterization of groundwater under MDAs G, H, and L is underway as data are collected from the completed network of new and existing wells. Groundwater monitoring for TA-54 is conducted with perched-intermediate well screens at R-40i, R-40 screen 1, R-23i, and R-37 screen 1, R-55i and regional wells: R-20, R-21, R-22, R-23, R-32, R-37, R-38, R-39, R-40, R-41, R-49, R-51, R-52, R-53, R-54, R-55, R-56, and R-57 (Figure 5.1-1). R-22 is not currently being sampled. The actively sampled wells have one or two screens, all of which are equipped with purgeable sampling systems.

The monitoring at TA-54 provides the basis for accurately describing the groundwater conditions beneath TA-54. The sampling plan for each of the wells within the TA-54 monitoring group is presented in Table 5.4-1. Base-flow and alluvial groundwater wells near and downgradient of TA-54 are not included in the TA-54 monitoring group because no evidence was found of a hydrologic connection between the subsurface contamination beneath TA-54 and adjacent canyons, as discussed in the Pajarito Canyon and Cañada del Buey IRs (LANL 2009, 106939; LANL 2009, 107497).

The regional monitoring-well network downgradient of the MDAs in TA-54 is a system that includes redundancy and is designed to provide reliable detection of potential contaminants reaching the regional aquifer. The wells are located both near the facility boundary and at more distal locations along the dominant regional flow direction as well as along potential local flow directions to the northeast. The locations of wells also address potential complex pathways for contaminants in the vadose zone. Because of the difficulties associated with monitoring groundwater that occurs in lavas beneath TA-54, the network is made up of two-screen wells with an upper well screen placed as close to the water table as possible to monitor the first arrival of contaminants in the aquifer and a lower screen placed in permeable aquifer sediments to monitor the primary groundwater pathways downgradient of the facility.

5.4 Scope of Activities

Active monitoring locations of the TA-54 monitoring group are focused on intermediate-perched and regional groundwater wells. These locations are shown in Figure 5.1-1.

Sampling locations, frequencies, analytical suites, and the rationale for these locations are presented in Table 5.4-1. The FD screening tables for the TA-54 monitoring group are presented in Attachment B-1 of Appendix B (on CD).

Exceptions to the analytical suites and sampling frequencies presented in Tables 1.6-2 may occur for some locations listed in Table 5.4-1. The wells in the TA-54 monitoring group are sampled semiannually. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

6.0 TA-16 260 MONITORING GROUP

6.1 Introduction

The TA-16 260 monitoring group (Figure 6.1-1) was established for the upper Water Canyon/ Cañon de Valle watershed to detect and monitor contaminants released from Consolidated Unit 16-021(c)-99, 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 for almost 50 yr 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 deep-perched and regional groundwater at TA-16.

The TA-16 260 monitoring group includes springs, alluvial wells, and wells completed in several deep perched-intermediate 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, a 200-ft-deep ravine with steep walls, separates NM 4 from active sites at TA-16. Cañon de Valle forms the northern border of TA-16.

6.2 Background

Surface water in the area consists of stormwater and snowmelt runoff that flows in canyon drainages, including Cañon de Valle, Fishladder Canyon, and Martin Spring (S-Site) Canyon. Fishladder Canyon also receives snowmelt and stormwater runoff. Alluvial groundwater occasionally discharges at Fishladder Spring. The surface flow in Fishladder Canyon decreased significantly once the TA-16 340 Outfall was deactivated.

The TA-16 260 monitoring group includes alluvial monitoring wells in Cañon de Valle (CdV-16-02659), in Fish Ladder Canyon (FLC-16-25280), and in Martin Spring Canyon (MSC-16-06295). Groundwater in these alluvial systems is shallow, and water levels generally show responses to snowmelt runoff.

The vadose zone at TA-16 is approximately 1000 ft to 1300 ft thick and is recharged by mountain-front precipitation and subsequent infiltration along the Pajarito fault zone east of TA-16 and along canyons (e.g., infiltration along upper Cañon de Valle). The vadose zone contains one shallow suite of perched water zones (less than 200 ft depth from the mesa top) and two significant deep- perched-intermediate groundwater zones between approximately 750 ft and 1200 ft bgs. The shallow perched zones are heterogeneous and controlled by fractures and surge beds near the Tshirege unit 3/4 contact. They manifest as three springs (SWSC, Burning Ground, and Martin), as intermittently saturated zones in several boreholes in the northern portions of TA-16, and in a continuously-saturated borehole near the 90s Line Pond. The deep perched-intermediate groundwater zones are believed to extend from west to east for more than 6500 ft and from north to south for approximately 3280 ft. Perched-intermediate groundwater was encountered at R-26 screen 1; R-25b, R-25 screens 1, 2, 4; CdV-16-1i; CdV-16-2ir; and R-47i. No perched groundwater was observed at R-18 and R-48, limiting its north-south extent. The low permeability Tschicoma dacite observed in R-48 (approximately 2000 ft south of Cañon de Valle) may impede the southward flow of water in the deep-perched system. The perched zones are present both within the Otowi Member of the Bandelier Tuff (R-25, R-25b, and CdV-16-1[i]) and within the Puye Formation (CdV-16-4ip and CdV-16-2[i]r). In the vicinity of CdV-16-4ip, the two perched zones are separated by a 100 ft to 150 ft of Puye sediments under variable saturation (LANL 2011, 203711). The degree of hydraulic connection between the perched horizons and the regional aquifer has not been fully analyzed to date, but will be assessed in future reports.

Water-level data indicate groundwater within the perched horizons generally flows from west to east. There is some evidence of a southerly component of flow within the Otowi Member of the Bandelier Tuff in the vicinity of R-25, possibly from recharge along Cañon de Valle. Water-level data from multiple screens in R-25 and from the two screens of CdV-16-4ip indicate water levels within the deep-perched system are lower with depth, suggesting significant vertical anisotropy, with vertical hydraulic conductivities perhaps orders of magnitude lower than horizontal hydraulic conductivities in some strata (LANL 2011, 203711).

The regional aquifer in the vicinity of northern TA-16 is predominantly unconfined, with the water table located within the Puye Formation at a depth of approximately 1108 ft to1353 ft bgs. Groundwater flow in the shallow portion of the regional aquifer is generally eastward, with some perturbation near R-25, perhaps reflecting local recharge. Downgradient (east) of R-25, the regional groundwater flow direction incorporates a northerly component of flow near R-18 and R-17. Water levels in regional wells near TA-16 show little influence from transient effects of deeper water-supply pumping (LANL 2006, 091450).

Contaminant Sources and Distributions

Discharges from the former 260 Outfall during the past 50 yr at Consolidated Unit 16-021(c)-99 served as a primary source of source of HE and inorganic contamination found throughout the site (LANL 1998, 059891; LANL 2003, 085531). Results of the 260 Outfall CME (LANL 2007, 098734) show the drainage channel below the outfall and the canyon bottom as well as surface water, alluvial groundwater, and deep-perched groundwater, are contaminated with explosive compounds, including RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine); HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine); TNT (2,4,6 trinitrotoluene); and barium. In addition, the VOCs tetrachloroethane and TCE have been detected in springs, alluvial groundwater, and perched-intermediate groundwater. Low concentrations of PCE have also been detected in the regional aquifer in R-25 (screen 5).

The primary migration pathway for these contaminants is believed to consist of (1) discharge as effluent from the 260 Outfall, (2) surface flow to Cañon de Valle via a small tributary drainage, (3) downcanyon transport by surface water flow and alluvial groundwater, (4) and infiltration through the vadose zone as recharge to the deep-perched groundwater zones and potentially into the regional aquifer.

Groundwater in the perched horizons contains the largest inventory of HE in the environment on a mass basis; estimates range from as low as approximately 700 kg of RDX to as high as approximately 8000 kg of RDX. Investigations of vadose zone and regional groundwater at TA-16 have been conducted during the past several years, and the results of these investigations are discussed in several reports (e.g., Longmire 2005, 088510; LANL 2006, 093798; LANL 2007, 096003; LANL 2007, 095787; LANL 2011, 203711).

6.3 Monitoring Objectives

The objective for the TA-16 260 monitoring group is to further refine nature and extent for contamination originating from the area and to monitor fate and transport for observed contaminants. These data will support the pending CME for perched-intermediate and regional groundwater (Plate 1) (LANL 2007, 098734; LANL 2008, 103165). This group's monitoring focuses on HE, barium, and VOC contamination in the upper Cañon de Valle watershed (Table 1.6-2).

Characterization sampling for a wide range of potential contaminants in groundwater from TA-16 (e.g., fission-product radionuclides, SVOCs, pesticides, PCBs, dioxins/furans) has been completed for the majority of wells in the group. These constituents have not been detected beyond sporadic, low-level detections that can be attributed to infrequent but normal analytical issues, as summarized in the FD tables in Attachment B-1 of Appendix B (on CD).

6.4 Scope of Activities

Active monitoring locations in the TA-16 260 monitoring group include alluvial groundwater wells, perched-intermediate groundwater wells, regional groundwater wells, and springs. These locations are shown in Figure 6.1-1.

Sampling locations, frequencies, analytical suites, and the rationale for these locations are presented in Table 6.4-1. The FD screening tables for Water Canyon/Cañon de Valle are presented in Attachment B-1 of Appendix B (on CD).

Additional base-flow, spring, and alluvial groundwater monitoring is conducted as general surveillance in the watershed (section 8.6). Monitoring of deep groundwater from the perched-intermediate and regional aquifers reflects a long-term data set that indicates what constituents are present and their trends and variability. Additional rounds are maintained for some constituents in the perched-intermediate groundwater as an early-detection location for potential migration of those constituents from secondary sources in the vadose zone.

Exceptions to the analytical suites and sampling frequencies presented in Table 1.6-2 may occur for some locations listed in Table 6.4-1. The sampling frequency for the wells in the TA-16 260 monitoring group is based on the presence of RDX contamination; those locations consistently showing RDX are sampled semiannually, while those locations that do not show significant contamination are sampled annually. Sampling at new well R-63 will transition from quarterly to semiannually during MY2011. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

7.0 MDA AB MONITORING GROUP

7.1 Introduction

The MDA AB monitoring group is located in TA-49 and includes one monitoring well completed in perched-intermediate groundwater and three wells completed in the regional aquifer. TA-49, also known as the Frijoles Mesa Site, is located on a mesa in the upper part of the Ancho Canyon drainage and part of the area drains into Water Canyon. The MDA AB monitoring group is shown in Figure 7.1-1.

TA-49 was used for underground hydronuclear testing in the early 1960s. The testing consisted of criticality, equation-of-state, and calibration experiments involving special nuclear materials. The testing produced large inventories of radioactive and hazardous materials: isotopes of uranium and plutonium, lead, and beryllium; explosives such as TNT, RDX, HMX; and barium nitrate. Much of this material remains in shafts on the mesa top. Further information about activities and SWMUs and AOCs at TA-49 can be found in recent Laboratory reports (LANL 2010, 109318; LANL 2010, 109319). The RCRA facility investigation work plan also describes the planned investigations that focus on identifying and quantifying migration of contaminants from the shafts.

7.2 Background

Both main Ancho Canyon and the north fork of Ancho Canyon head on the Pajarito Plateau in the south-central part of the Laboratory. Approximately 2.2 mi^2 (5.6 km^2 is drained by the north fork of Ancho Canyon and, above the confluence with the north fork, approximately 2.3 mi^2 (5.8 km^2) is drained by main Ancho Canyon. Surface-water flow is ephemeral and occurs as runoff, primarily following infrequent, intense thunderstorms or during snowmelt. Its source is direct precipitation and runoff from surrounding mesa tops. No perennial sources of surface water exist at TA-49.

In 1960, the USGS drilled three deep wells (test wells DT-5A, DT-9, and DT-10) to monitor regional aquifer water quality. No contaminants were found in these wells at concentrations near or above standards. As with other wells installed around the Laboratory using mild carbon steel during that period, samples from these three test wells have shown elevated metals concentrations related to corrosion or flaking of well components. In 2010, the total lead concentration in a sample from test well DT-9 of 20.1 µg/L was above the EPA drinking water system action level of 15 µg/L. Another sample during the year had a total lead result of less than 2 µg/L. Some results during the 1990s were above 50 µg/L.

Several deep mesa-top boreholes and wells have been drilled to intermediate depths of 300 ft to 700 ft bgs (49-CH-1 through 49-CH-4, 49-2-700) and to the regional aquifer (DT-5A, DT-9, DT-10, R-29, and R-30). No perched-intermediate groundwater zones were encountered when these wells were drilled (LANL 2006, 093714; LANL 2010, 110478; LANL 2010, 110518). A moisture profile for the 700-ft deep mesa-top borehole 49-2-700-1 (Figure B-2.0-1) shows low moisture content (<17% by weight) throughout the profile; the profile is similar to those beneath other dry mesas and indicates that infiltration along neighboring canyons does not impact moisture beneath the mesa at TA-49. In addition, 49-Gamma was drilled to 54 ft bgs in upper Ancho Canyon, and wells 49-9M-2 through 49-9M-4 were drilled in the drainage of the upper north fork of Ancho Canyon; these boreholes were dry when drilled. These observations show a lack of shallow perched groundwater in the upper portions of the Ancho watershed.

Perched-intermediate groundwater was encountered in Water Canyon, approximately 3500 ft northeast of MDA AB during the drilling of R-27 in 2005. The perched zone was detected at 628 ft bgs in the Puye Formation immediately above the Cerros del Rio basalt. Monitoring well R-27i was subsequently installed in September 2009 with a single screen to evaluate water quality and measure water levels in the perched zone.

Springs and seeps are known to occur in the lower reaches of Water and Ancho Canyons, far downgradient of TA-49 (near the Rio Grande), but none have been identified within the boundaries of TA-49 (LANL 2007, 098492).

The top of the regional aquifer occurs approximately 1126 ft to 1153 ft bgs, based on water levels in monitoring wells R-29 and R-30. The potentiometric surface of the regional aquifer beneath TA-49 lies completely within the Puye Formation and the Cerros del Rio basalt. Groundwater flow in the upper portion of the regional aquifer at TA-49 is generally eastward.

Contaminant Sources and Distributions

The primary contaminants at MDA AB and other disposal areas in TA-49 include tritium, radionuclides (plutonium-238, plutonium-239/240, americium-241, and cesium-137), arsenic, chromium, copper, lead, and perchlorate. Radionuclides have been detected in canyon sediments, but no elevated levels of contaminants have been detected in groundwater in the wells that comprise the MDA AB monitoring group. Three decades of water-quality records from regional wells in this area (test wells DT-5A, DT-9, and DT-10) show no substantial changes in water chemistry or the presence of Laboratory contaminants in the regional aquifer. Perchlorate has been detected slightly above background in R-27i.

7.3 Monitoring Objectives

The monitoring objectives for the MDA AB monitoring group are to characterize the groundwater beneath MDA AB and ultimately to support the MDA AB CME process. New regional aquifer wells R-29 and R-30 have been drilled immediately downgradient of MDA AB at TA-49. The older test wells, DT-5A, DT-9, and DT-10, will no longer be monitored because of their potential for nonrepresentative data associated with well casing and screen materials, the long well screened intervals (617 ft, 681 ft, and 329.6 ft, respectively) and because they have been effectively replaced by R-29 and R-30.

7.4 Scope of Activities

Frequency, analytical suites, and the rationale for monitoring at each location are presented in Table 7.4-1. Groundwater monitoring for MDA AB has historically been conducted primarily at the DT-series regional aquifer wells. Recently installed wells R-29 and R-30 have been incorporated into the monitoring network for MDA AB and will be monitored annually to support the corrective action process for MDA AB.

Exceptions to the analytical suites and sampling frequencies presented in Table 1.6-2 may occur for some locations listed in Table 7.4-1. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

8.0 GENERAL SURVEILLANCE MONITORING GROUP

8.1 Overview

Monitoring locations not associated with project-specific monitoring groups are included in the general surveillance monitoring group. This group includes base-flow locations, alluvial monitoring wells, and springs, except for those assigned to the TA-16 260 monitoring group. The general surveillance group also includes some wells completed in perched-intermediate zones or in the regional aquifer that are not associated with area-specific monitoring groups.

General surveillance monitoring locations are sited across the Pajarito Plateau in all the major watersheds. Some are upgradient of project specific areas or are in areas where contamination was historically present, but where concentrations have since fallen and are stable and below standards. General surveillance monitoring locations for Los Alamos/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, and Frijoles, Ancho and Chaquehui Canyons are shown in Figure 8.1-1. General surveillance monitoring locations for White Rock Canyon are shown in Figure 8.1-2.

Most general surveillance locations are well-characterized and have a long history of sampling data. Some locations show little or no contamination, while others show residual contamination from past operations or effluent releases. The residual contamination may be present in surface water, alluvial groundwater, and occasionally in perched-intermediate groundwater. In many cases, contaminant concentrations at these locations are fairly steady over time or decreasing as a result of reductions in sources over the years.

8.2 Monitoring Objectives

The primary monitoring objectives for the general surveillance locations are

- to continue monitoring long-term water quality trends;
- to continue verifying decreasing contaminant trends at general surveillance locations in some watersheds (Los Alamos, Sandia, and Mortandad);
- to monitor for potential impacts from ongoing operations under DOE requirements for environmental surveillance; and
- to continue surveillance for potential Laboratory impacts to the groundwater, as expressed at the springs in White Rock Canyon.

8.3 Scope of Activities

These objectives can be met at all general surveillance locations through annual monitoring at the majority of all general surveillance locations, with a few exceptions. Semiannual monitoring is proposed at two locations, monitoring well 03-B-13 (because of elevated and highly variable VOC and SVOC concentrations) and at Basalt Spring (to meet monitoring requirements under the MOU). Quarterly monitoring is proposed at R-34 to meet monitoring requirements under the MOU.

Base-flow locations will be monitored using dedicated probes to measure field parameters. Specific conductance and pH will be logged hourly. Base-flow locations monitored under general surveillance (Figure 8.1-1) will include the following:

- Water Canyon between E252 and Water at Beta (existing location)
- Pajarito below TA-14 (new location)
- Two Mile Canyon below TA-64 (new location)
- Sandia above Wetlands (new location)
- Sandia below Wetlands (existing location)

New locations will be sited based on the presence of persistent surface water. The probes will be installed by April 1, 2012. Water, Twomile, and Pajarito Canyons may be prone to flooding during the summer months because of the changed hydrology in these watersheds following the 2011 Las Conchas fire. The monitoring probes may be removed from these watersheds during the summer months (June 15 through September 30) to avoid damage or loss.

Tables 8.3-1 and 8.3-2 list the sampling locations, the rationale for these locations, the analytical suites, and frequencies for the general surveillance group. The locations in the general surveillance monitoring group are sampled annually, with the exceptions noted above. The objectives for the sampling frequency and analytical suites are presented in Table D-1.

9.0 REFERENCES AND MAP DATA SOURCES

9.1 References

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Record Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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9.2 Map Data Sources

Water sampling locations: ER Project Locations; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division, 2010-2E; 1:2,500 Scale Data; 04 October 2010.

Primary drainage: Watercourse; Los Alamos National Laboratory, ENV Water Quality & Hydrology Group; 05 April 2005.

Paved road: Road Centerlines for the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

MDA: Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004.

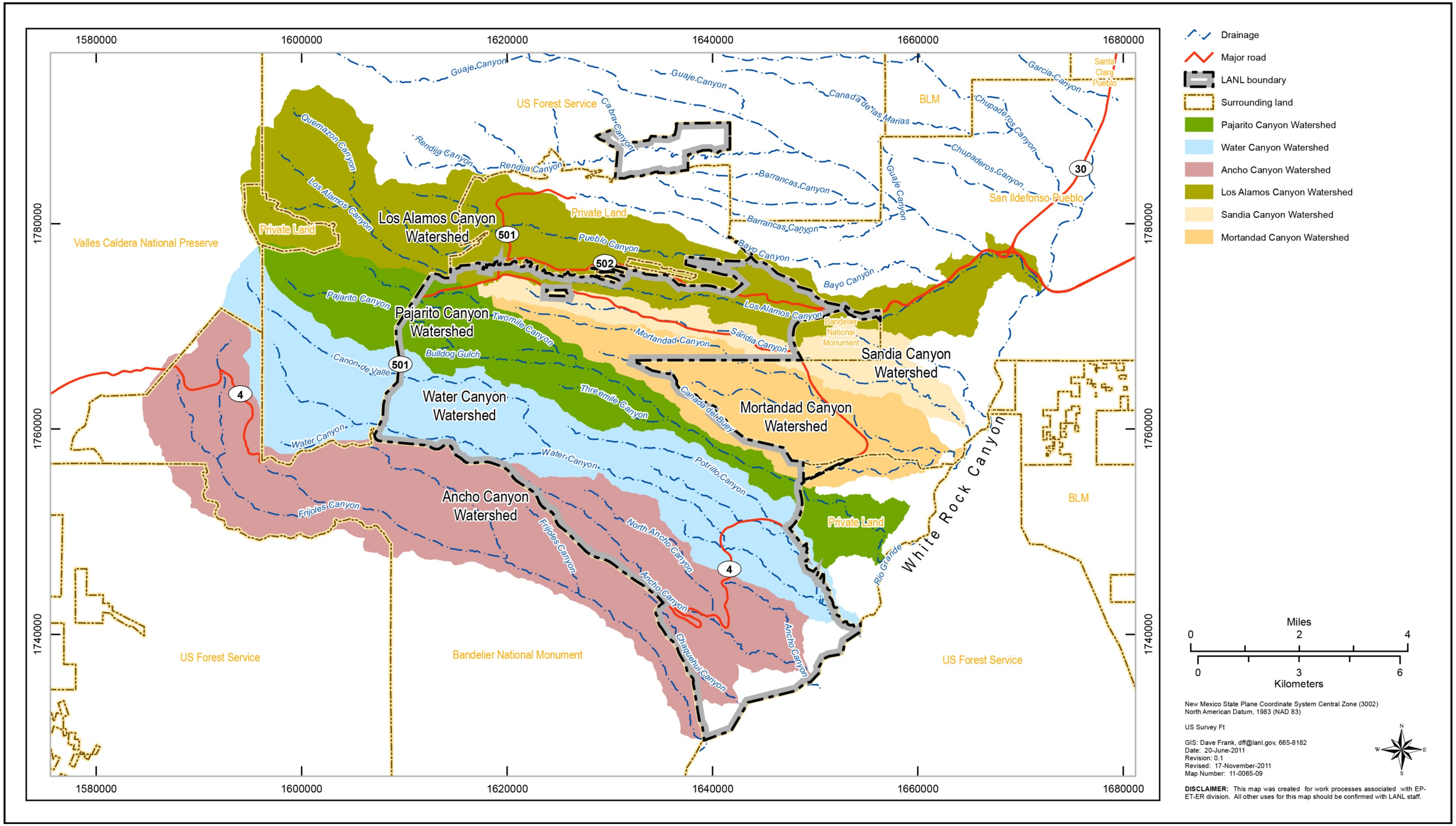
LANL boundary: LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 13 August 2010.

Land ownership: LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 13 August 2010.

TA boundary: Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 13 August 2010.

LANL structure: Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Watershed: Watersheds; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; EP2006-0942; 1:2,500 Scale Data; 27 October 2006.



New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 20-June-2011
Revision: 0.1
Revised: 17-November-2011
Map Number: 11-0065-09

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Figure 1.2-1 Watersheds at Los Alamos National Laboratory

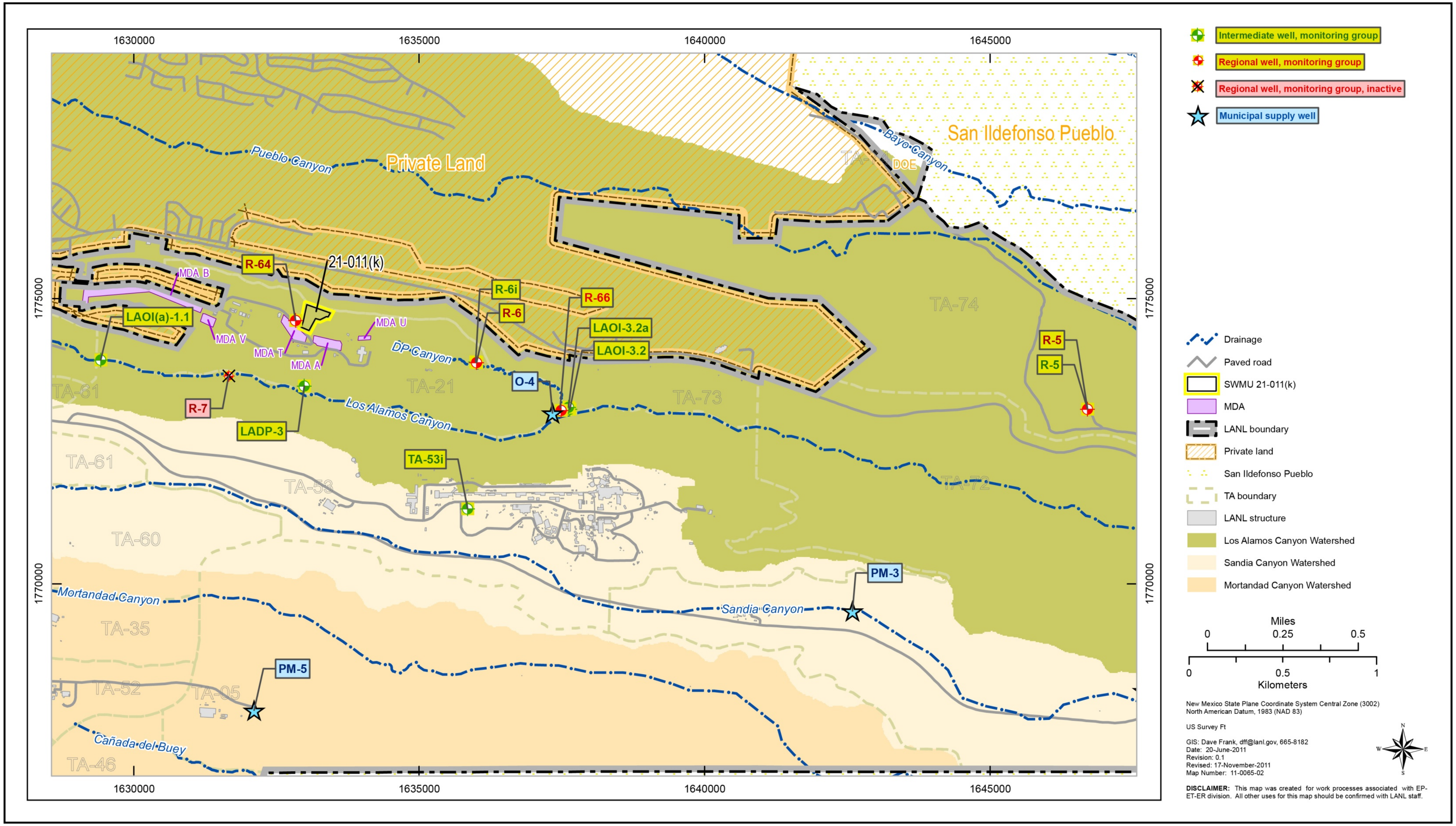


Figure 2.1-1 TA-21 monitoring group

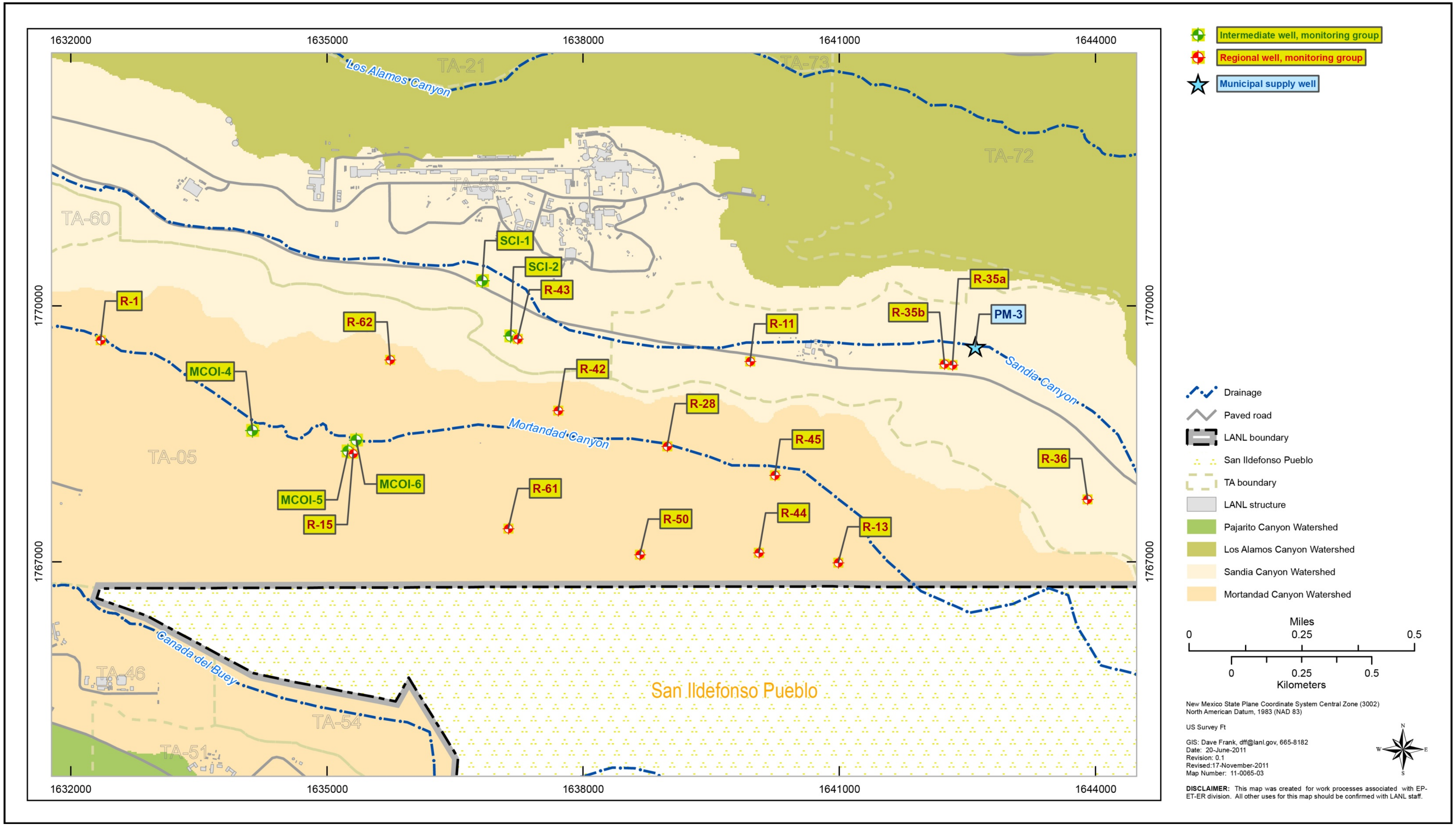


Figure 3.1-1 **Chromium investigation monitoring group**

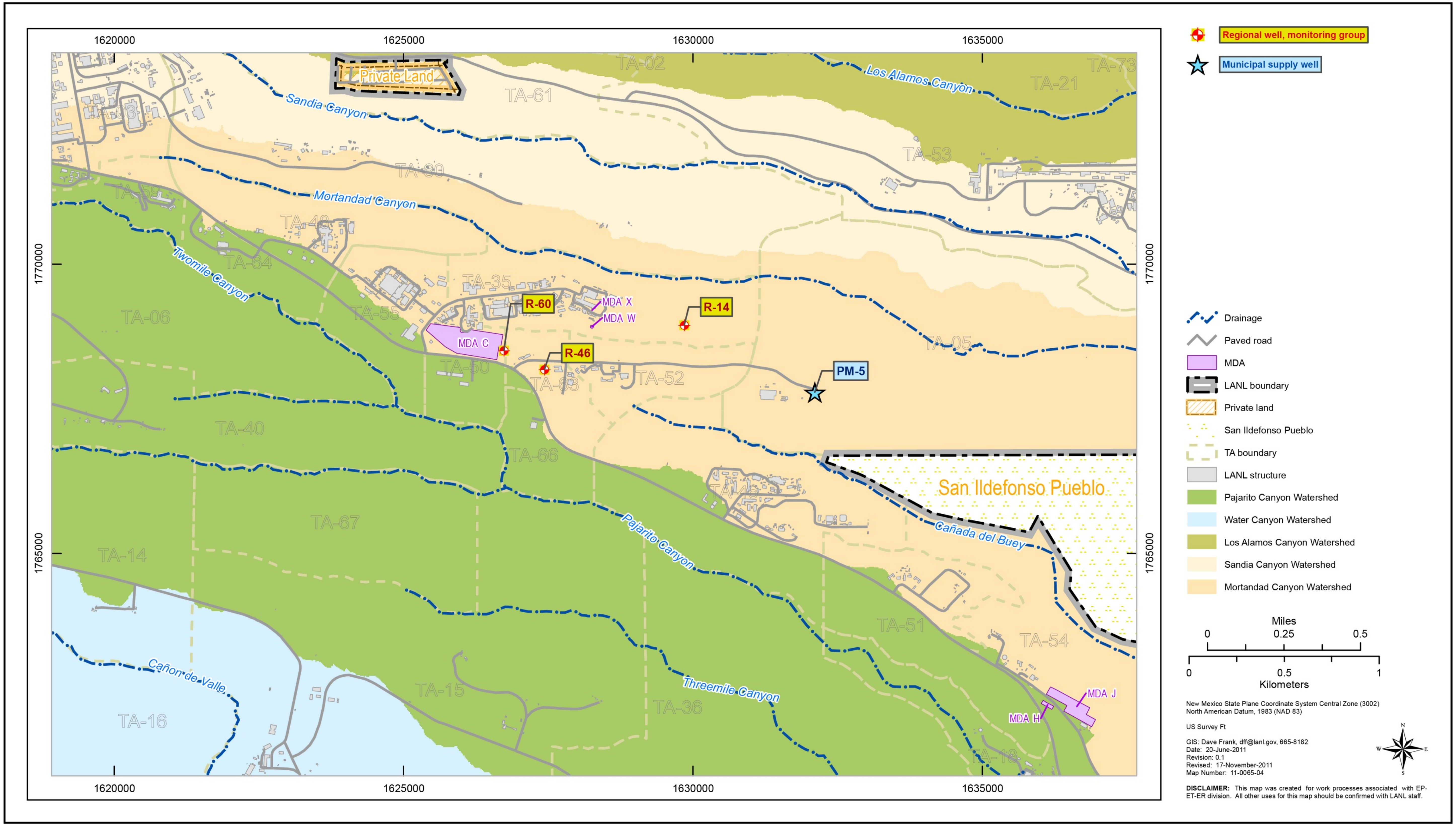
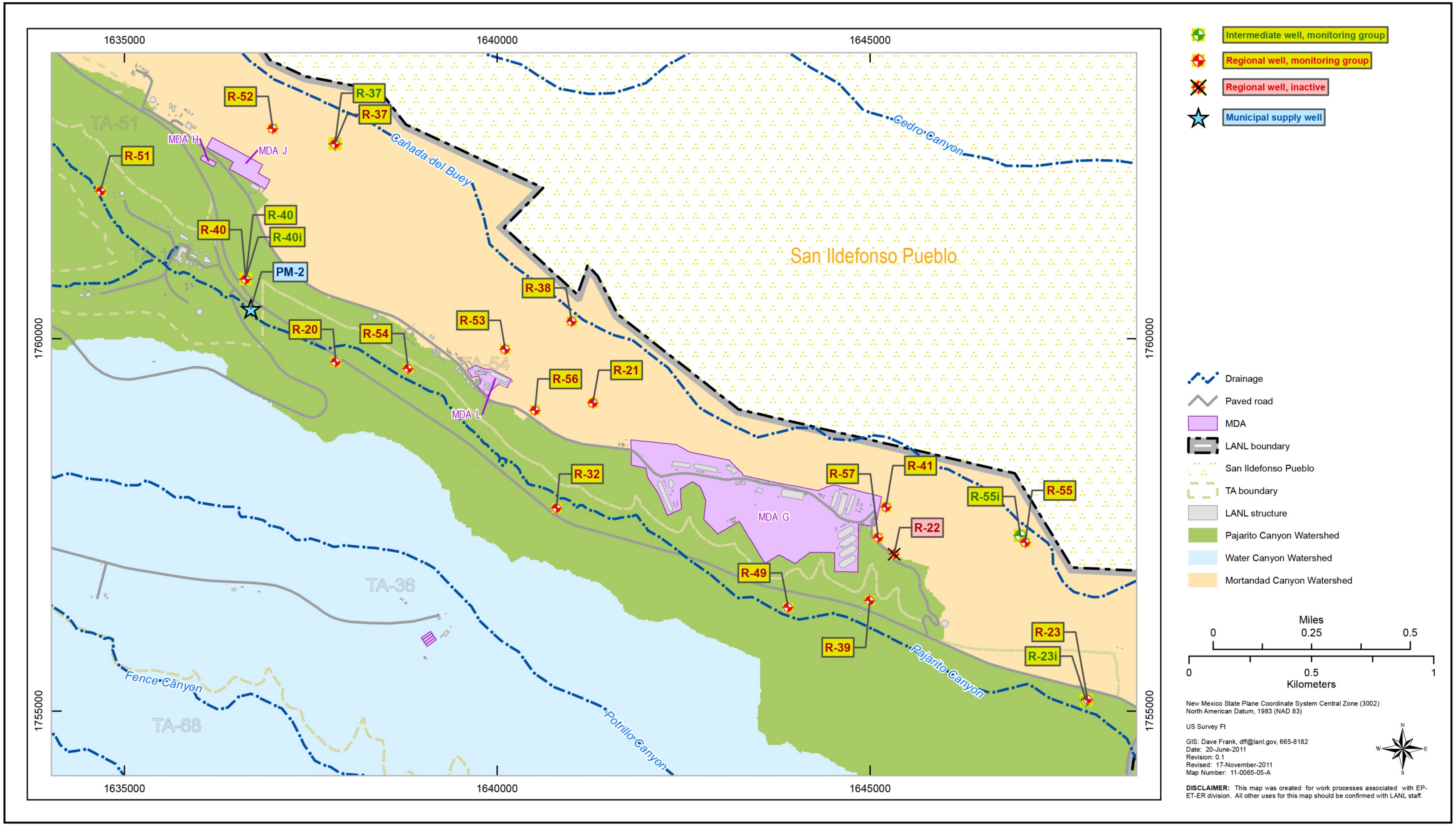


Figure 4.1-1 MDA C monitoring group



New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 20-June-2011
Revision: 0.1
Revised: 17-November-2011
Map Number: 11-0065-05-A

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Figure 5.1-1 Monitoring well network for TA-54 MDAs H, L, and G

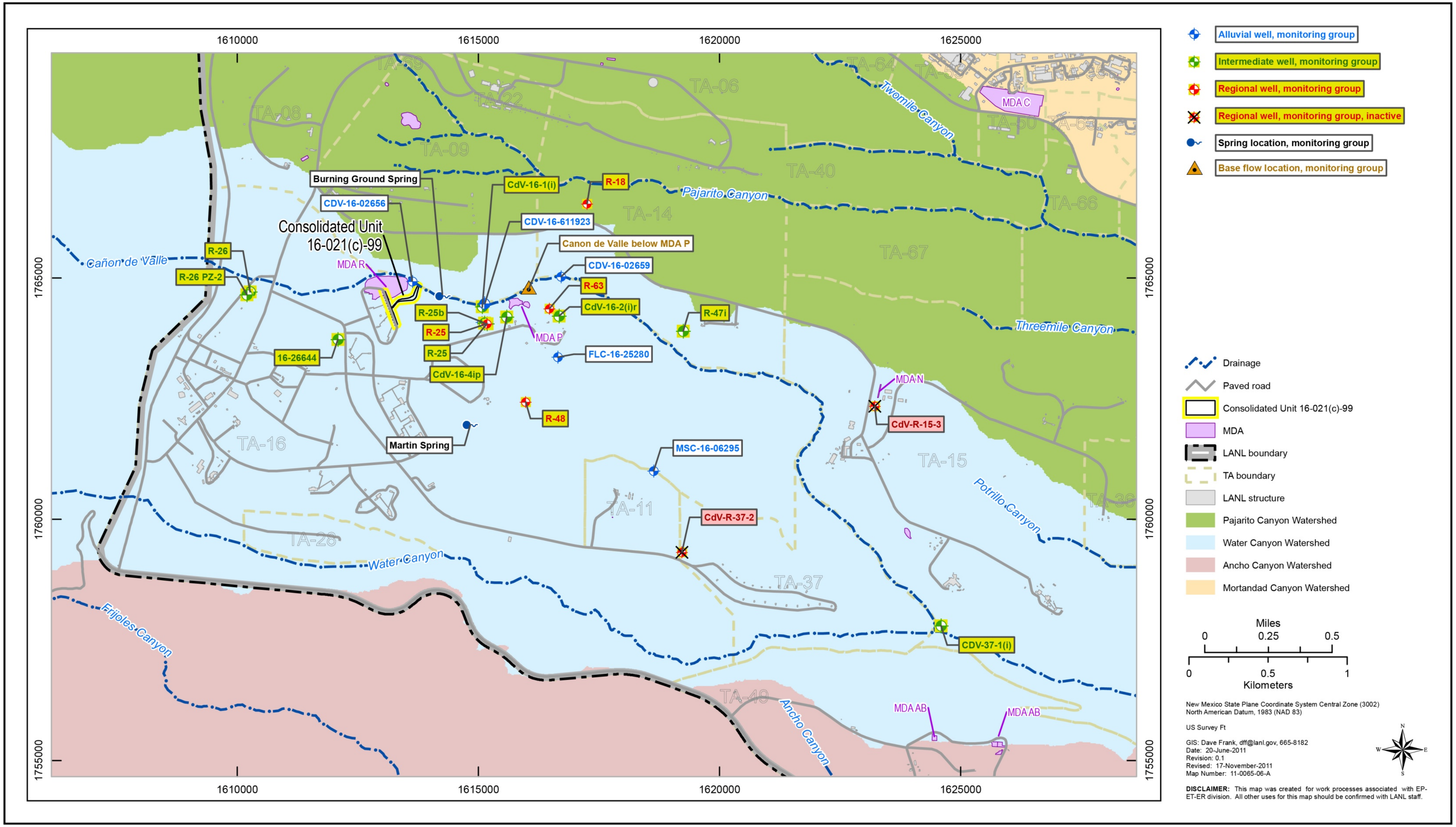

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Figure 6.1-1 TA-16 260 Outfall monitoring group

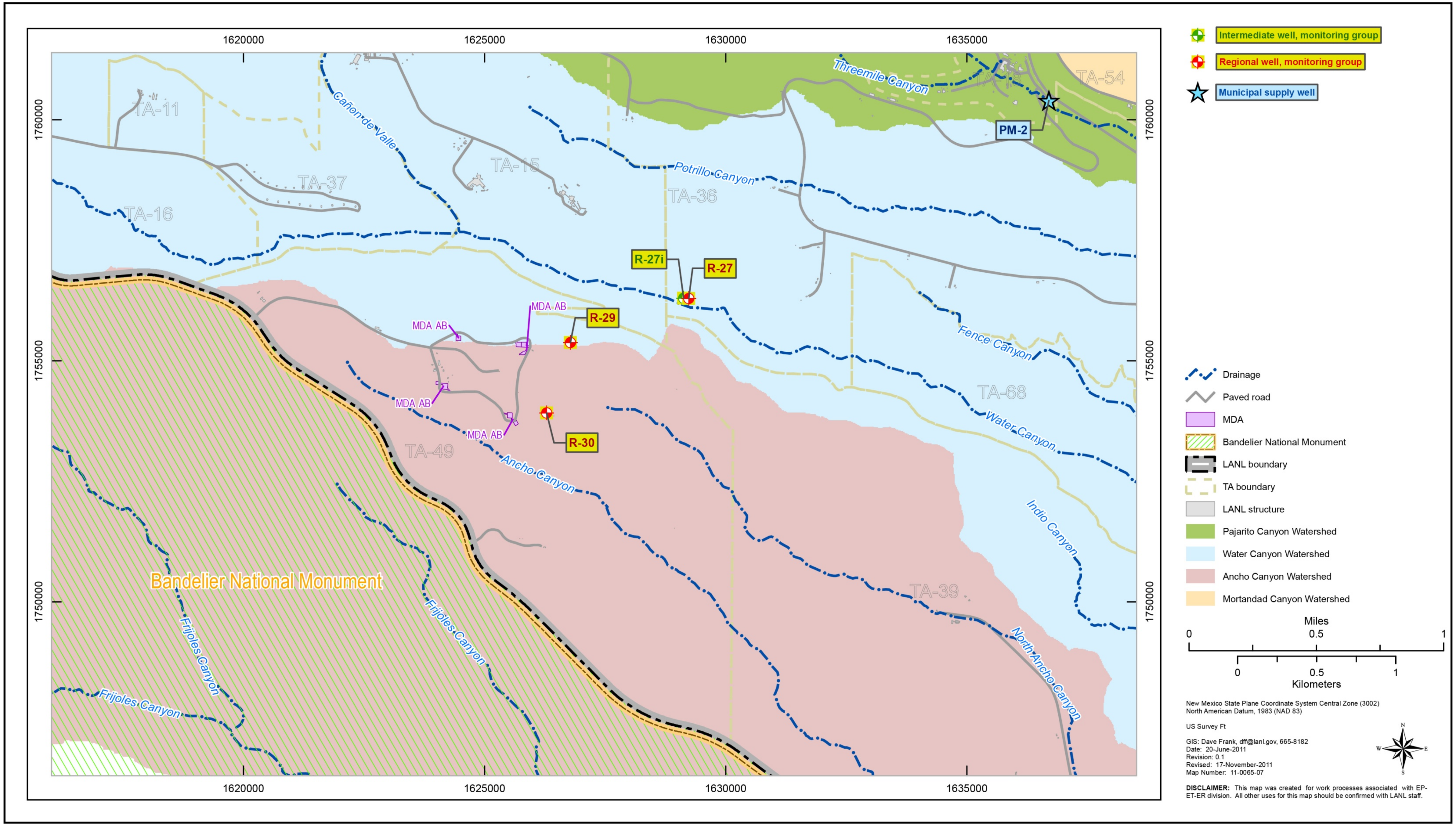
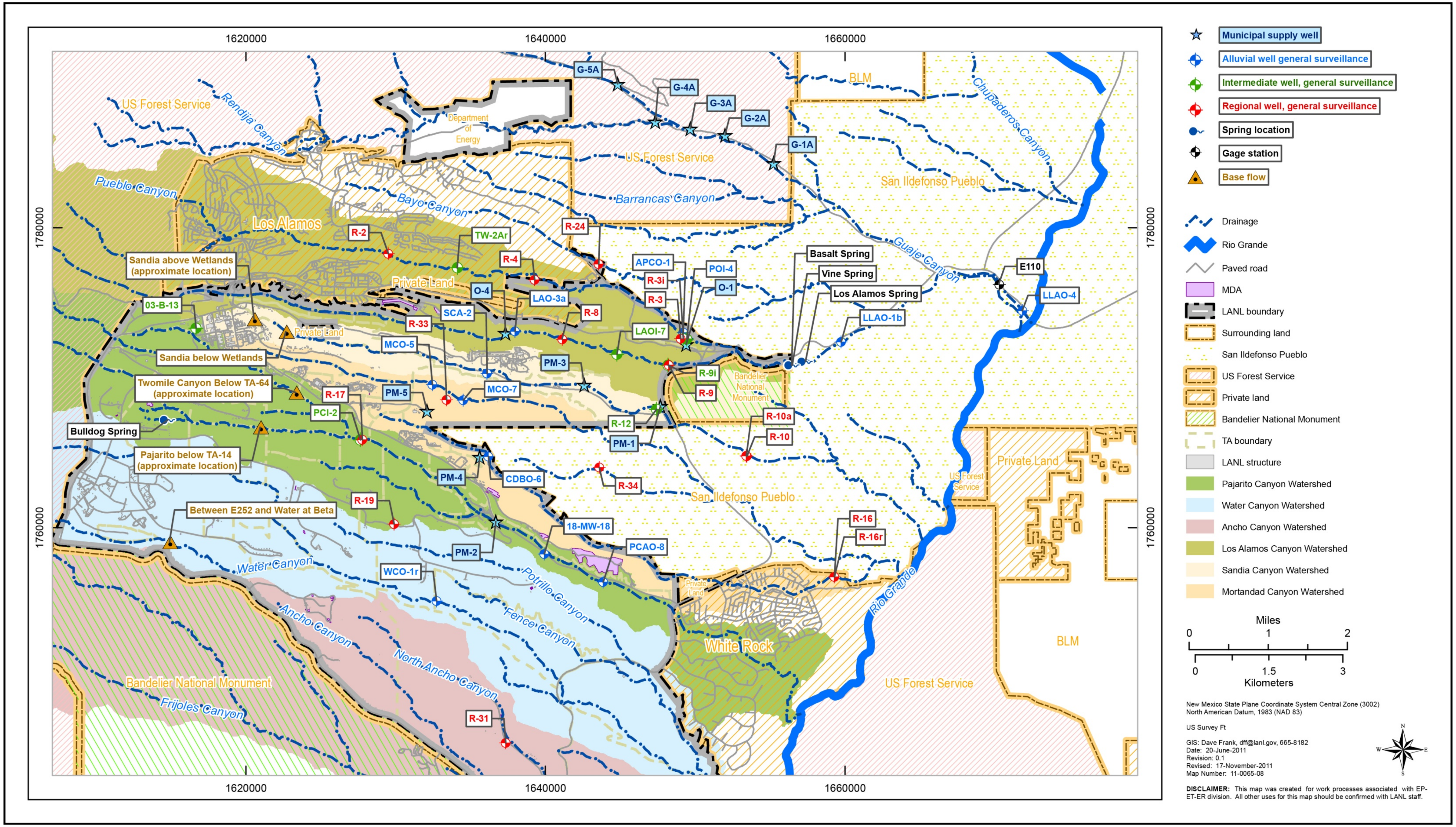


Figure 7.1-1 **MDA AB monitoring group**



New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 20-June-2011
Revision: 0.1
Revised: 17-November-2011
Map Number: 11-0065-08

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Figure 8.1-1 General surveillance

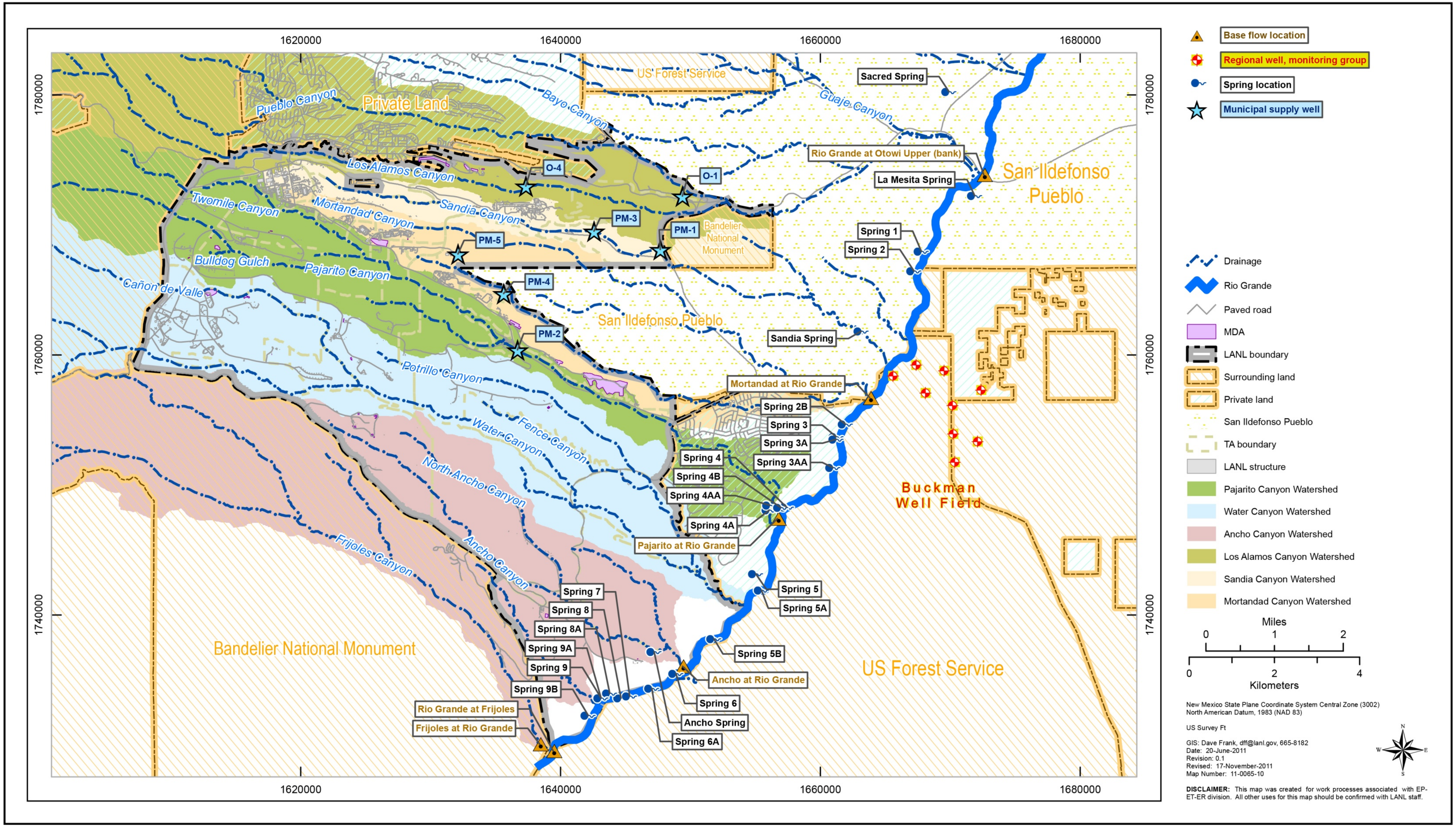

Figure 8.1-2 General surveillance, White Rock Canyon

Table 1.6-1
Potentially Applicable Standards Used to Select Base-Flow and Groundwater Screening Levels

Type	Source	Description	Abbreviation[a]	Potential Applicability[b]					
				Perennial Surface Water		Ephemeral Surface Water		Groundwater (Includes Springs)	
				F[c]	UF[d]	F	UF	F	UF
State of New Mexico Water Quality Control Commission (NMWQCC)									
Standard	NMAC 20.6.4	Livestock Watering	NM LVSTK WTR STD	X	X	X	X		
Standard	NMAC 20.6.4	Wildlife Habitat	NM WQCC WLDLF HAB		X		X		
Standard	NMAC 20.6.4	Aquatic Life Acute	NM Aqu Acute *x* mg[e]			X	X		
Standard	NMAC 20.6.4	Aquatic Life Chronic	NM Aqu Chronic *x* mg[e]	X	X				
Standard	NMAC 20.6.4	Human Health Standard	NM HH OO	X	X	X	X		
Standard	NMAC 20.6.2	Groundwater Human Health Standards, Other Standards for Domestic Water Supply and Standards for Irrigation Use	NM GW STD					X	X
Consent Order									
Screening level	Consent Order	Screening Level for Perchlorate in Groundwater	NM GW CONS					X	X
EPA									
Standard	40 CFR 141	EPA maximum contaminant levels	EPA MCL					X	X
Risk—human	EPA Regional Screening Levels[f]	EPA Regional Screening Levels for Tap Water	EPA TAP SCRN LVL					X	X
DOE									
Risk—ecological	DOE Order 458.1	DOE Biota Concentration Guides	DOE BCG WATER	X	X	X	X		
Risk—human	DOE Order 458.1	DOE 4-mrem Drinking Water Derived Concentration Guidelines	DOE DW DCG					X	X

[a] Abbreviations used in the screening tables in Attachment B-1 of Appendix B.

[b] The protocol for selecting the lowest applicable screening levels for groundwater and surface water is described in Appendix B. The description includes assumptions and rationale for hardness-dependent metals. Blank cells indicate the screening level is not applicable to the water type.

[c] F = Filtered.

[d] UF = Unfiltered.

[e] *x* indicates the hardness concentration (as mg/L) used to calculate screening levels for hardness-dependent trace metals.

[f] EPA Regional Screening Levels (EPA 2011, 204336).

Table 1.6-2
Analytical Suites and Frequencies for Locations Assigned to Area-Specific Monitoring Groups

	Metals[a] (filtered)	Organics			Radionuclides			General Inorganics		
Surface-Water Body or Source Aquifer	**TAL Metals**	**VOCs[b]**	**SVOCs[b]**	**HEXP[c]**	**Radionuclides[d]**	**Tritium[e]**	**Low-Level Tritium[e]**	**General Inorganics[f]**	**Perchlorate**	**Field Data[g]**
TA-21 Monitoring Group (Upper Los Alamos and Sandia Canyons)										
Intermediate	—[h]	—	—	—	A	A	A	A	A	A
Regional	—	—	—	—	A	—	A	A	A	A
Characterization of new deep groundwater wells[i]	Q	Q	Q	S	Q	—	Q	Q	Q	Q
Chromium Investigation Monitoring Group (Sandia and Mortandad Canyons)										
Intermediate (Sandia)	S	—	—	—	A	A	—	S	S	S
Intermediate (Mortandad)	A	A	A	—	A	A	—	A	A	A
Regional	A	—	—	—	B	—	A	A	A	A
Characterization of new deep groundwater wells	Q	S	S	S	S	—	S	Q	Q	Q
MDA C Monitoring Group (Mortandad and Pajarito Canyons)										
Regional	—	S	S	—	A	—	S	A	—	S
TA-54 Monitoring Group (Mortandad Canyon/Cañada del Buey and Pajarito Canyons)										
Intermediate	A	S	A	—	A	—	S	A	—	S
Regional	A	S	A	—	A	—	S	A	—	S
TA-16 260 Monitoring Group (Water Canyon/Cañon de Valle and Pajarito Canyon)										
Base flow	S	S	—	S	B	—	—	S	—	S
Springs	S	S	—	S	B	—	—	S	—	S
Alluvial	S	S	—	S	B	—	—	A	—	S
Intermediate	S	S	—	S	B	—	—	A	—	S
Regional	A	A	—	A	B	—	—	A	—	A
Characterization of new deep groundwater wells	S	S	S	S	A	—	S	S	S	S

Table 1.6-2 (continued)

Surface-Water Body or Source Aquifer	Metals[a] (filtered)	Organics			Radionuclides			General Inorganics		Field Data[g]
	TAL Metals	VOCs[b]	SVOCs[b]	HEXP[c]	Radionuclides[d]	Tritium[e]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate	
MDA AB Monitoring Group (Ancho and Water Canyons)										
Intermediate	A	A	A	A	A	—	A	A	—	A
Regional	A	A	A	A	A	—	A	A	—	A

Notes: Sampling suites and frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time every 2 yr). Some locations assigned to an area-specific monitoring group may be assigned analytical suites or frequencies that differ from those shown in this table for site-specific reasons documented in Appendixes D and F.

[a] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] VOCs = Volatile organic compounds; SVOCs = semivolatile organic compounds.

[c] The analytical suite of explosive compounds (HEXP) includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene.

[d] The radionuclide suite includes gross alpha, gross beta, strontium-90, and radionuclides analyzed by alpha and gamma spectroscopy.

[e] Tritium samples may be submitted for analysis by liquid scintillation if the average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus; total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness. TKN, TOC and total cyanide are analyzed only in unfiltered samples.

[g] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified. Alkalinity will be measured for all samples either in the field or at the on-site Earth Systems Observations (EES-14) laboratory.

[h] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[i] Characterization suites and frequencies apply to new intermediate perched or regional groundwater wells assigned to this monitoring group. “New” wells are defined as those completed or converted on or after October 1, 2010.

Table 1.6-3
Analytical Suites and Frequencies for Locations Assigned to General Surveillance Monitoring

	Metals[a] (filtered)	Organics			Radionuclides			General Inorganics		Suspended Sediments	Field Data[g]
Surface-Water Body or Source Aquifer	**Metals (filtered)**	**VOCs[b]**	**SVOCs[b]**	**HEXP[c]**	**Radionuclides[d]**	**Tritium[e]**	**Low-Level Tritium[e]**	**General Inorganics[f]**	**Perchlorate**		
Characterization of New Deep Groundwater Wells[h]											
Characterization	Q	Q	Q	S	Q	—[i]	Q	Q	Q	—	Q
Northern locations (Los Alamos/Pueblo, Sandia, and Mortandad Canyons)											
Springs	A	—	—	—	A	—	—	A	A	A	A
Alluvial	A	—	—	—	A	—	—	A	A	—	A
Intermediate	A	—	—	—	A	—	—	A	A	—	A
Regional	A	—	—	—	A	—	—	A	A	—	A
Southern locations (Pajarito, Water Canyon/Cañon de Valle, Frijoles, Ancho, and Chaquehui Canyons)											
Springs	A	—	—	A	A	—	—	A	A	A	A
Alluvial	A	—	—	A	A	—	—	A	A	—	A
Intermediate	A	—	—	A	A	—	—	A	A	—	A
Regional	A	—	—	A	A	—	—	A	A	—	A
White Rock Canyon and Rio Grande Watershed											
Base flow north of confluence with Mortandad Canyon	A	—	—	—	A	—	—	A	A	A	A
Base flow south of confluence with Mortandad Canyon	A	A	T	—	A	—	—	A	A	A	A

Table 1.6-3 (continued)

Surface-Water Body or Source Aquifer	Metals[a] (filtered)	Organics			Radionuclides			General Inorganics			
	Metals (filtered)	VOCs[b]	SVOCs[b]	HEXP[c]	Radionuclides[d]	Tritium[e]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate	Suspended Sediments	Field Data[g]
Springs north of confluence with Mortandad Canyon	A	A	T	T	A	—	A	A	A	A	A
Springs south of confluence with Mortandad Canyon	A	A	A	A	A	—	A	A	A	A	A

Notes: Sampling suites and frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time every 2 yr). Some locations assigned to an area-specific monitoring group may be assigned analytical suites or frequencies that differ from those shown in this table for site-specific reasons documented in Appendixes D and F.

[a] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] VOCs = Volatile organic compounds; SVOCs = semivolatile organic compounds.

[c] The analytical suite of explosive compounds (HEXP) includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene.

[d] The radionuclide suite includes gross alpha, gross beta, strontium-90, and radionuclides analyzed by alpha and gamma spectroscopy.

[e] Tritium samples may be submitted for analysis by liquid scintillation if the average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus; total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness. TKN, TOC and total cyanide are analyzed only in unfiltered samples.

[g] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified. Alkalinity will be measured for all samples either in the field or at the on-site Earth Systems Observations (EES-14) laboratory.

[h] Characterization suites and frequencies apply to new intermediate perched or regional groundwater wells assigned to this monitoring group. “New” wells are defined as those completed or converted on or after October 1, 2010.

[i] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 1.8-1
Sampling Schedule for MY2011: October 1, 2011–September 30, 2012

Monitoring Group or Watershed	Location Type	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
		Oct–Dec 2011	Jan–Mar 2012	Apr–Jun 2012	Jul–Sep 2012
Monitoring Groups					
TA-54	Routine	T, A, S, Q	—	S	—
Chromium Investigation	Routine	T, A, S, Q	Q	S, Q	Q
MDA C	Routine	A, S	—	S	—
TA-21	Routine	Q[a]	S, Q[b]	Q[b]	A, S, Q[b]
MDA AB	Routine	—	A	—	—
TA-16 260	Routine	Q[c]	A, B, S, Q[c]	—	S
General Surveillance					
Los Alamos and Pueblo Canyons	Routine	S[d]	—	A, S[d]	—
Mortandad and Sandia Canyons	Routine	Q	Q, S[e]	Q	Q, T, A, S[e]
Pajarito Canyon	Routine	S[f]	—	A, S[f]	—
Frijoles, Ancho, and Chaquehui Canyons	Routine	—	A	—	
Water Canyon	Routine	—	—	—	A
White Rock Canyon	Routine	A	—	—	—
Characterization					
All Watersheds	Characterization	Q	Q	Q	Q

Notes: Sampling frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time every 2 yr); T= triennial (1 time every 3 yr); — = no samples are scheduled to be collected from this monitoring group during this period.

[a] R-64.

[b] R-64 and R-66.

[c] R-26 screen 1 and R-63.

[d] Basalt or Vine Tree Spring.

[e] R-34.

[f] 03-B-13.

Table 1.9-1
Frequencies for Locations Assigned to Water-Level Monitoring Only

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
Los Alamos/Pueblo Canyons Watershed				
TA-21 Monitoring Group	R-5 screen 1	Well located downgradient of upper Pueblo and Acid Canyons. Screen has been dry since well installation (2001) although water was observed in the sump below the screen (Koch and Schmeer 2011, 201566). Automated monitoring of water levels maintained to determine if the zone wets up.	Intermediate	C^{HD}
	R-7 screen 1	Well located in middle Los Alamos Canyon. Screen 1 went dry during sampling in December 2003 (Koch and Schmeer 2011, 201566). The zone produced water during drilling, and the screen produced small amounts of water for a short period following installation. Water was detected in the sump below the screen since 2005. Automated monitoring of water levels maintained to determine if either zone recovers.	Intermediate	C^{HD}
	R-7 screen 2	Well located in middle Los Alamos Canyon. Screen 2 has been dry since well installation in 2001 although water has been observed in the sump since mid-2008 (Koch and Schmeer 2011, 201566). Automated monitoring of water levels maintained to determine if either zone recovers.	Intermediate	C^{HD}
	R-7 screen 3	Well located in middle Los Alamos Canyon. The collection of water-quality samples from this screen is suspended because it remains impacted by drilling products. Automated monitoring of water levels should be maintained to monitor the top of the regional aquifer	Regional	C
General Surveillance	LAO-4.5c	Monitors location down canyon below Los Alamos/DP Canyon confluence.	Alluvial	C
	LAUZ-1	Well is located downgradient of Reach DP 2. Continue monitoring water levels and specific conductance using Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	PAO-2	Well is located approximately mid-way between SCA-3 and the easternmost drainage from the TA-53 complex. Continue monitoring water levels and specific conductance using Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
Sandia Canyon Watershed				
General Surveillance	SCA-1	Well located in wetland in upper Sandia Canyon. Sampling events were moved to nearby drive point well SCA-1-DP because of silting in of the screen in SCA-1. Continuous water levels are monitored in SCA-1, and manual measurements are taken at SCA-1-DP during sampling events (Koch and Schmeer 2011, 201566).	Alluvial	C
	SCA-4	Well located in lower Sandia Canyon approximately mid-way between SCA-3 and the easternmost drainage from the TA-53 complex. Water-level monitoring will provide data regarding impacts from Sandia wetlands mitigation activities.	Alluvial	C

Table 1.9-1 (continued)

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
Mortandad Canyon Watershed				
General Surveillance	MCO-2	Well monitors Effluent Canyon above the TA-50 outfall. Continue monitoring water levels and specific conductance using Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	MCO-3	Well monitors upper part of Mortandad Canyon. Water-level data from MCO-3 will be used to document hydrologic characteristics of the alluvial groundwater following reduction of discharges from the TA-50 RLWTF outfall since 2010. Aqua Troll transducer will be used to assess salinity impacts from snowmelt runoff.	Alluvial	C
TA-54 Monitoring Group	R-41 screen 1	Well located east of MDA G at TA-54. Screen 1 has been dry since well installation (March 2009) (Koch and Schmeer 2011, 201566). Water level should be checked annually during sampling of R-41.	Intermediate	A^{HD}
Pajarito Canyon Watershed				
General Surveillance	PCAO-7b2	Well characterizes potential impacts from TA-18. Continue monitoring water levels and specific conductance using Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	R-19 screen 1	Well located on a mesa south of Threemile Canyon and downgradient of TA-16. Screen 1 has been dry since installation of the Westbay sampling system in September 2000 (Koch and Schmeer 2011, 201566). Water-level data will continue to be monitored in this screen.	Intermediate	C^{HD}
	R-19 screen 5 R-19 screen 6 R-19 screen 7	Well located on a mesa south of Threemile Canyon and downgradient of TA-16. The collection of water-quality samples from these screens is suspended because they remain impacted by drilling products. Water-level data will continue to be collected from these screens until well R-19 is reconfigured or replaced.	Regional	C
Water Canyon/Cañon de Valle Watershed				
TA-16 260 Monitoring Group	R-25 screen 3	Located at TA-16 within the Cañon de Valle watershed. Screen 3 has always been dry but the screen was damaged during installation and is not reliable for water-level monitoring (Koch and Schmeer 2011, 201566). Pump water at screen 3 responded to drilling and installation of adjacent well R-25c (replacement for R-25 screen 3) in August 2008.	Intermediate	C
Ancho Canyon Watershed				
General Surveillance	R-31 screen 1	Located in the north Ancho Canyon tributary. Zone initially showed water during drilling but has been dry since installation of the Westbay system in April 2000 (Koch and Schmeer 2011, 201566). Water-level data will continue to be monitored in this screen.	Intermediate	C^{HD}

Table 1.9-1 (continued)

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
	R-31 screen 2 R-31 screen 3	The collection of water-quality samples from these screens is suspended because they remain impacted by drilling products. Water-level data will continue to be monitored in these screens.	Regional	C
Water-Level Data from Water-Supply Wells (Koch and Schmeer 2011, 201566)				
Cooperative Agreement	G-1A, G-2A, G-3A, G-5A	Water-supply wells located in Guaje Canyon	Regional	C
	G-4A	Water-supply well located in lower Rendija Canyon near its confluence with Guaje Canyon	Regional	C
	O-1	Water-supply well located in lower Pueblo Canyon	Regional	C
	O-4	Water-supply well located in Los Alamos Canyon above confluence with DP Canyon	Regional	C
	PM-1 and PM-3	Water-supply wells located in Sandia Canyon	Regional	C
	PM-2	Water-supply well located in Pajarito Canyon	Regional	C
	PM-4	Water-supply well located on Mesita del Buey south of Mortandad Canyon	Regional	C
	PM-5	Water-supply well located on a mesa south of Ten Site and Mortandad Canyons	Regional	C

* Sampling frequency: C = continuous; Q = quarterly (4 times/yr at set time periods); S = semiannual (2 times/yr); A = annual (1 time/yr). The superscript HD indicates this sampling location is historically dry. Continuous monitoring for groundwater refers to the measurement of groundwater-level measurements by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year).

Table 2.4-1
Interim Monitoring Plan for TA-21 Monitoring Group

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
LADP-3	LADP-3	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	—[j]	—	—	—	A	—	A	A	A	A
LAOI(a)-1.1	LAOI(a)-1.1	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Background location in Groundwater Background Investigation Report, Revision 3 (GBIR R3) (LANL 2007, 095817) and Groundwater Background Investigation Report, Revision 4 (GBIR R4) (LANL 2010, 110535).	Intermediate	C	—	—	—	—	A	—	A	A	A	A
LAOI-3.2	LAOI-3.2	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	—	—	—	—	A	A	—	A	A	A
LAOI-3.2a	LAOI-3.2a	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	—	—	—	—	A	A	—	A	A	A

Table 2.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-5 screen 2	R-5 S2	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Intermediate	C	—	—	—	—	A	—	A	A	A	A
R-6i	R-6i	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	—	A	A	—	A	A	—	A	A	A
TA-53i	TA-53i	Los Alamos	Monitors for potential southward migration of contaminants from sources in Los Alamos Canyon. Located within TA-53 on the mesa separating Los Alamos and Sandia Canyons.	Intermediate	C	—	—	—	—	A	A	—	A	A	A
R-5 screen 3	R-5 S3	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	—	—	—	—	A	—	A	A	A	A
R-5 screen 4	R-5 S4	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	—	—	—	—	A	—	A	A	A	A

Table 2.4-1 (continued)

Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-6	R-6	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Background location in GBIR R4.	Regional	C	—	—	—	—	A	A	—	A	A	A
R-64	R-64	Los Alamos	New single-screen regional well. Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and at TA-21. Completed July 15, 2011.[k]	Regional	C	Q	Q	Q	S	Q	—	Q	Q	Q	Q
R-66	R-66	Los Alamos	New regional well to replace TW-3, located near Otowi-4. Monitors for potential contaminants from upper Los Alamos and DP Canyons and TA-21. Completed 11/16/11.	Regional	C	Q	Q	Q	S	Q	—	Q	Q	Q	Q

Table 2.4-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[i] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise..

[j] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[k] Characterization suites and frequencies apply to new perched-intermediate or regional groundwater wells. “New” wells are defined as those completed, rehabilitated, or converted on or after October 1, 2010.

Table 3.4-1
Interim Monitoring Plan for Chromium Investigation Monitoring Group

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	**New Location Name**	**Watershed**	**Rationale for Selection of Location**	**Surface Water Body or Source Aquifer**	**Water Level or Flow[a]**	**Metals (Filtered)[b]**	**VOCs[c]**	**SVOCs[c]**	**HEXP[d]**	**Radionuclide[e]**	**Tritium[f]**	**Low-Level Tritium[f]**	**Gen Inorganics[g]**	**Perchlorate[h]**	**DO, ORP, pH, SC, T, Turb**
SCI-1	SCI-1	Sandia	Monitors the first perched-intermediate groundwater encountered along the key infiltration pathway in Sandia Canyon.	Intermediate	C	S	—[j]	—	—	A	A	—	S	S	S
SCI-2	SCI-2	Sandia	Monitors key infiltration pathway in Sandia Canyon.	Intermediate	C	Q	—	—	—	A	A	—	Q	Q	Q
R-11	R-11	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos Canyon.	Regional	C	Q	—	—	—	B	—	A	Q	Q	Q
R-35a	R-35a	Sandia	Sentinel monitoring location for chromium contamination in regional groundwater. Located within the same stratigraphic zone as the upper louvered section of water-supply well PM-3.	Regional	C	A	—	—	—	B	—	A	A	A	A
R-35b	R-35b	Sandia	Sentinel monitoring location for chromium contamination in the regional groundwater. Located near the water table above the louvered section of water-supply well PM-3.	Regional	C	A	—	—	—	B	—	A	A	A	A

Table 3.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-36	R-36	Sandia	Monitors for potential contaminants from the Sandia Canyon source and other potential sources from canyons to the north. Also serves as a sentinel well for water-supply well PM-1.	Regional	C	A	—	—	—	B	—	A	A	A	A
R-43 screen 1	R-43 S1	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	C	Q	—	—	—	B	—	A	Q	Q	Q
R-43 screen 2	R-43 S2	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	C	Q	—	—	—	B	—	A	Q	Q	Q
MCOI-4	MCOI-4	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	S	A	A	—	A	A	—	S	S	S
MCOI-5	MCOI-5	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	A	A	A	—	A	A	—	A	A	A
MCOI-6	MCOI-6	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	Q	A	A	—	A	A	—	Q	Q	Q
R-1	R-1	Mortandad	Monitors for potential contaminants from upper Mortandad Canyon or possibly Sandia Canyon. Background location in GBIR R3.	Regional	C	A	—	—	—	B	—	A	A	A	A

Table 3.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-13	R-13	Mortandad	Monitors for nature and extent of contaminants originating in Mortandad and Sandia Canyons. Key lower boundary well. Background location in GBIR R3.	Regional	C	A	—	—	—	B	—	A	A	A	A
R-15	R-15	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons.	Regional	C	S	—	—	—	B	—	A	S	S	S
R-28	R-28	Mortandad	Monitors for potential contaminants from upper Sandia, Mortandad, or Ten Site Canyons or possibly sources in canyons to the north.	Regional	C	Q	—	—	—	B	A	—	Q	Q	Q
R-42	R-42	Mortandad	Key characterization and monitoring point located upgradient of R-28.	Regional	C	Q	—	—	—	B	A	—	Q	Q	Q
R-44 screen 1	R-44 S1	Mortandad	Monitors near the water table for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	C	S	—	—	—	B	—	A	S	A	S
R-44 screen 2	R-44 S2	Mortandad	Monitors for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	C	S	—	—	—	B	—	A	S	A	S

Table 3.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-45 screen 1	R-45 S1	Mortandad	Monitors near the water table for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	C	S	—	—	—	B	—	A	S	A	S
R-45 screen 2	R-45 S2	Mortandad	Monitors for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	C	S	—	—	—	B	—	A	S	A	S
R-50 screen 1	R-50 S1	Mortandad	Monitoring well located on the mesa south of Mortandad Canyon to define the southern extent of chromium contamination in the regional aquifer.	Regional	C	Q	—	—	—	B	—	S	Q	Q	Q
R-50 screen 2	R-50 S2	Mortandad	Monitoring well located on the mesa south of Mortandad Canyon to define the southern extent of chromium contamination in the regional aquifer.	Regional	C	Q	—	—	—	B	—	S	Q	Q	Q
R-61 screen 1	R-61 S1	Mortandad	New well located on the mesa south of Mortandad Canyon to define the western extent of the flow path for chromium migration. Completed May 3, 2011.[k]	Regional	C	Q	S	S	S	S	—	S	Q	Q	Q
R-61 screen 2	R-61 S2	Mortandad	New well located on the mesa south of Mortandad Canyon to define the western extent of the flow path for chromium migration. Completed May 3, 2011.[k]	Regional	C	Q	S	S	S	S	—	S	Q	Q	Q

Table 3.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-62 screen 1	R-62 S1	Mortandad	New well located on a ridge between Sandia and Mortandad Canyon at the east end of Sigma Mesa. Completed October 3, 2011.[k]	Regional	C	Q	S	S	S	S	—	S	Q	Q	Q
R-62 screen 2	R-62 S2	Mortandad	New well located on a ridge between Sandia and Mortandad Canyon at the east end of Sigma Mesa. Completed October 3, 2011.[k]	Regional	C	Q	S	S	S	S	—	S	Q	Q	Q

Table 3.4-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[i] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

[j] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[k] Characterization suites and frequencies apply to new perched-intermediate or regional groundwater wells. “New” wells are defined as those completed, rehabilitated, or converted on or after October 1, 2010.

Table 4.4-1
Interim Monitoring Plan for MDA C Monitoring Group

						Analytical Suites							
						Metals	Organics			Radionuclides		Inorganics	Field[h]
Old Location Name	**New Location Name**	**Watershed**	**Rationale for Selection of Location**	**Surface Water Body or Source Aquifer**	**Water Level or Flow[a]**	**Metals (Filtered)[b]**	**VOCs[c]**	**SVOCs[c]**	**HEXP[d]**	**Radionuclide[e]**	**Low-Level Tritium[f]**	**Gen Inorganics[g]**	**DO, ORP, pH, SC, T, Turb**
R-14	R-14	Mortandad	Monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon, including MDA C. Background location in GBIR R4.	Regional	C	—[i]	S	S	—	A	S	A	S
R-46	R-46	Mortandad	Monitors groundwater quality downgradient of MDA C.	Regional	C	—	S	S	—	A	S	A	S
R-60	R-60	Mortandad	New monitoring well installed east of MDA C. Monitors for potential contaminant releases from MDA C. Completed October 18, 2010.[j]	Regional	C	S	S	S	—	A	S	S	S

Table 4.4-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

[i] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[j] Characterization suites and frequencies apply to new perched-intermediate or regional groundwater wells. “New” wells are defined as those completed, rehabilitated, or converted on or after October 1, 2010.

Table 5.4-1
Interim Monitoring Plan for TA-54 Monitoring Group

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-23i piezometer (port 1)	R-23i PIEZ	Pajarito	Downgradient monitoring location for TA-54. Monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	A	A	S	A	—[j]	A	A	—	A	—	S
R-23i screen 1 (port 2)	R-23i S2	Pajarito	Downgradient monitoring location for TA-54. Also monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	C	A	S	A	—	A	—	S	A	—	S
R-23i screen 2 (port 3)	R-23i S3	Pajarito	Downgradient monitoring location for TA-54. Monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	C	A	S	A	—	A	—	S	A	—	S
R-40i	R-40 Si	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed. Screen impacted by drilling fluids.	Intermediate	C	A	S	A	—	A	—	S	A	—	S
R-20 screen 1	R-20 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-20 screen 2	R-20 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S

Table 5.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-23	R-23	Pajarito	Downgradient monitoring location for TA-54. Also monitors potential sources in Pajarito watershed and possible sources from canyons to the north.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-32	R-32	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-39	R-39	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-40 screen 1	R-40 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Intermediate	C	—	S	—	—	—	—	S	—	—	S
R-40 screen 2	R-40 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-49 screen 1	R-49 S1	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-49 screen 2	R-49 S2	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon. Background location in GBIR R4.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-51 screen 1	R-51 S1	Pajarito	Monitoring well installed west of MDAs H and J and northwest of TA-18. Monitors TA-54 and other potential contaminant sources in Pajarito Canyon. Completed February 8, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S

Table 5.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-51 screen 2	R-51 S2	Pajarito	Monitoring well installed west of MDAs H and J and northwest of TA-18. Monitors TA-54 and other potential contaminant sources in Pajarito Canyon. Completed February 8, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-54 screen 1	R-54 S1	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L. Completed January 29, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-54 screen 2	R-54 S2	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L. Completed January 29, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-37 screen 1	R-37 S1	Mortandad	Monitors perched-intermediate groundwater downgradient of MDA H.	Intermediate	C	A	S	S	—	A	—	S	A	—	S
R-55i	R-55i	Mortandad	Intermediate well located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon. Completed January 18, 2011.[k]	Intermediate	C	S	S	S	S	A	—	S	S	S	S

Table 5.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-21	R-21	Mortandad	Monitors regional groundwater in Mortandad Canyon. Background location in GBIR R3 and GBIR R4.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-37 screen 2	R-37 S2	Mortandad	Monitors regional groundwater downgradient of MDA H.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-38	R-38	Mortandad	Monitors groundwater downgradient of MDA L in the north fork of Cañada del Buey in the Mortandad watershed.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-41 screen 2	R-41 S2	Pajarito	Monitors groundwater near northeast corner of MDA G.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-52 screen 1	R-51 S1	Pajarito	Located north-northeast of MDAs H and J on mesa south of Cañada del Buey. Monitors for potential releases of contaminants from MDA H. Completed March 31, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-52 screen 2	R-51 S2	Pajarito	Located north-northeast of MDAs H and J on mesa south of Cañada del Buey. Monitors for potential releases of contaminants from MDA H. Completed March 31, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-53 screen 1	R-53 S1	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L. Completed March 29, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S

Table 5.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides			Inorganics		Field[i]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	DO, ORP, pH, SC, T, Turb
R-53 screen 2	R-53 S2	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L. Completed March 29, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-55 screen 1	R-55 S1	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon. Completed August 25, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-55 screen 2	R-55 S2	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon. Completed August 25, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-56 screen 1	R-56 S1	Pajarito	Located on Mesita del Buey between MDAs G and L. Monitors for potential contaminant releases from MDAs G and L and other sources in Pajarito Canyon. Completed July 19, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-56 screen 2	R-56 S2	Pajarito	Located on Mesita del Buey between MDAs G and L. Monitors for potential contaminant releases from MDAs G and L and other sources in Pajarito Canyon. Completed July 19, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S

Table 5.4-1 (continued)

						Analytical Suites									
						Metals	**Organics**			**Radionuclides**			**Inorganics**		**Field**[i]
Old Location Name	**New Location Name**	**Watershed**	**Rationale for Selection of Location**	**Surface Water Body or Source Aquifer**	**Water Level or Flow**[a]	**Metals (Filtered)**[b]	**VOCs**[c]	**SVOCs**[c]	**HEXP**[d]	**Radionuclide**[e]	**Tritium**[f]	**Low-Level Tritium**[f]	**Gen Inorganics**[g]	**Perchlorate**[h]	**DO, ORP, pH, SC, T, Turb**
R-57 screen 1	R-57 S1	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G. Completed June 8, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S
R-57 screen 2	R-57 S2	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G. Completed June 8, 2010.	Regional	C	A	S	A	—	A	—	S	A	—	S

Table 5.4-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[i] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

[j] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[k] Characterization suites and frequencies apply to new perched-intermediate or regional groundwater wells. “New” wells are defined as those completed, rehabilitated, or converted on or after October 1, 2010.

Table 6.4-1
Interim Monitoring Plan for TA-16 260 Monitoring Group

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	**New Location Name**	**Watershed**	**Rationale for Selection of Location**	**Surface Water Body or Source Aquifer**	**Water Level or Flow[a]**	**Metals (Filtered)[b]**	**VOCs[c]**	**SVOCs[c]**	**HEXP[d]**	**Radionuclide[e]**	**Low-Level Tritium[f]**	**Gen Inorganics[g]**	**Perchlorate[h]**	**Suspended Sed[i]**	**DO, ORP, pH, SC, T, Turb**
Cañon de Valle below MDA P (E256)	Cañon de Valle below MDA P	Water	Downgradient surface water location for 260 Outfall. Monitors HE and other contaminants in support of surface CME.	Base flow	C	S	S	—[k]	S	B	—	A	—	S	S
Martin Spring	Martin Spring	Water	Spring located in upper Martin/S-Site Canyon.	Spring	C	S	S	—	S	B	—	A	—	S	S
Burning Ground Spring	Burning Ground Spring	Water	Spring downgradient of TA-16 260 Outfall [Consolidated Unit 16-021(c)-99].	Spring	C	S	S	—	S	B	—	A	—	S	S
CdV-16-02656	CdV-16-02656	Water	Alluvial well location nearest to 260 Outfall drainage/Cañon de Valle confluence. Downgradient of MDA R. Monitors HE and other contaminants in support of surface CME.	Alluvial	C	S	S	—	S	B	—	A	—	S	S
CdV-16-02659	CDV-16-02659	Water	Downgradient alluvial well from 260 Outfall drainage confluence. Monitors HE and other contaminants in support of surface CME.	Alluvial	C	S	S	—	S	B	—	A	—	—	S
CdV-16-611923	CdV-16-611923	Water	Key location downgradient of 260 Outfall.	Alluvial	C	S	S	—	S	B	—	A	—	—	S

Table 6.4-1 (continued)

Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
FLC-16-25280	16-25280	Water	Alluvial well downgradient of Fishladder and Burning Ground.	Alluvial	C	S	S	—	S	B	—	A	—	—	S
MSC-16-06295	MSC-16-06295	Water	Alluvial well in S-Site/Martin Canyon downgradient of Martin Spring and several TA-16 SWMU sites.	Alluvial	C	A	A	—	A	B	—	A	—	—	A
16-26644	16-26644	Water	Intermediate well located at TA-16 southeast and downgradient of the 90s Line Pond.	Intermediate	C	S	S	—	S	B	—	A	—	—	S
CdV-16-1(i)	CdV-16-1(i)	Water	Located downgradient of the 260 Outfall.	Intermediate	C	S	S	—	S	B	—	A	—	—	S
CdV-16-2(i)r	CdV-16-2(i)r	Water	Located downgradient of the 260 Outfall.	Intermediate	C	S	S	—	S	B	—	A	—	—	S
CdV-16-4ip screen 1	CDV-16-4ip S1	Water	Hydrologic test well installed downgradient of the 260 Outfall to evaluate the hydrologic properties of the deep perched-intermediate aquifer in TA-16. Completed August 23, 2010.	Intermediate	C	S	S	S	S	A	S	S	S	—	S

Table 6.4-1 (continued)

Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
Cdv-37-1(i)	CDV-37-1(i)	Water	Located near the confluence of Water Canyon and Cañon de Valle. Monitors groundwater contamination in the perched-intermediate zone downgradient of TA-16.	Intermediate	C	A	A	—	A	B	—	A	—	—	A
R-25 screen 1	R-25 S1	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	—	S	—	S	B	—	A	—	—	S
R-25 screen 2	R-25 S2	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	S	S	—	S	B	—	A	—	—	S
R-25 screen 4	R-25 S4	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	S	S	—	S	B	—	A	—	—	S
R-25b	R-25b	Water	Located immediately west of R-25 on the mesa top in TA-16. Monitors perched-intermediate groundwater for potential contamination associated with effluent from the 260 Outfall. Installed as a replacement for screen 1 in R-25.	Intermediate	C	A	A	—	A	B	—	A	—	—	A
R-26 PZ-2	R-26 PZ-2	Water	Piezometer installed near R-26. Provides data for perched-intermediate groundwater upgradient of TA-16.	Intermediate	C	S	S	—	S	B	—	A	—	—	S

Table 6.4-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
R-26 screen 1	R-26 S1	Water	Provides site-specific background data for perched-intermediate groundwater upgradient of TA-16. Background location in GBIR R3. Converted to single-screen well.	Intermediate	C	S	S	S	S	A	S	S	S	—	S
R-47i	R-47i	Water	Located northeast of the 260 Outfall. Provides data in support of the 260 Outfall CME.	Intermediate	C	A	A	—	A	B	—	A	—	—	A
R-25 screen 5	R-25 S5	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	A	B	—	A	—	—	A
R-25 screen 6	R-25 S6	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	A	B	—	A	—	—	A
R-25 screen 7	R-25 S7	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	A	B	—	A	—	—	A
R-48	R-48	Water	Completed by deepening open borehole CdV-16-3(i). Monitors historical TA-16 sources.	Regional	C	A	A	—	A	B	—	A	—	—	A
R-63	R-63	Water	New single-screen regional well installed as a replacement for R-25 screen 5. Completed February 9, 2011.	Regional	C	S+Q	S+Q	S+Q	S+Q	A	S+Q	S+Q	S+Q	—	S+Q

Table 6.4-1 (continued)

Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Low-Level Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
R-18	R-18	Pajarito	Monitors for potential contaminants from sources in TA-16.	Regional	C	S	S	—	S	B	—	A	—	—	S

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[i] Suspended sed = Suspended sediment concentration.

[i] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

[k] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 7.4-1
Interim Monitoring Plan for MDA AB Monitoring Group

Old Location Name	New Location Name	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites							
						Metals	Organics			Radionuclides		Inorganics	Field[h]
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Low-Level Tritium[f]	Gen Inorganics[g]	DO, ORP, pH, SC, T, Turb
R-29	R-29	Ancho	Located downgradient of TA-49 MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB. Completed March 12, 2010.	Regional	C	A	A	A	A	A	A	A	A
R-30	R-30	Ancho	Located at the eastern edge of TA-49 and downgradient of MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB. Completed April 3, 2010.	Regional	C	A	A	A	A	A	A	A	A
R-27i	R-27i	Water	Monitors potential contamination associated with the perched-intermediate zone downgradient of historical TA-16 sources.	Intermediate	C	A	A	A	A	A	A	A	A
R-27	R-27	Water	Monitors TA-16 in support of the TA-16 260 Outfall CME. Background location in GBIR R4.	Regional	C	A	A	A	A	A	A	A	A

Table 7.4-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

Table 8.3-1
Interim Monitoring Plan for General Surveillance Monitoring

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
LAO-3a	LAO-3a	Upper Los Alamos Canyon	Monitors net effect of mixing of alluvial groundwater from Los Alamos and DP Canyons. Located just downcanyon of the confluence of Los Alamos and DP Canyons.	Alluvial	C	A	—[k]	—	—	A	—	A	A	—	A
LAOI-7	LAOI-7	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21.	Intermediate	C	A	—	—	—	A	A	A	A	—	A
R-9i screen 1	R-9i S1	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21 and possible southward perched-zone migration from Pueblo Canyon.	Intermediate	C	A	—	—	—	A	—	A	A	—	A
R-9i screen 2	R-9i S2	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21 and possible southward perched-zone migration from Pueblo Canyon.	Intermediate	C	A	—	—	—	A	—	A	A	—	A

Table 8.3-1 (continued)

Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Analytical Suites										
						Metals	Organics			Radionuclides		Inorganics			Field[j]	
						Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb	
R-8 screen 1	R-8 S1	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21.	Regional	C	A	—	—	—	A	—	A	A	—	A	
R-8 screen 2	R-8 S2	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21.	Regional	C	A	—	—	—	A	—	A	A	—	A	
R-9	R-9	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos and DP Canyons and TA-21 and or possible southward perched-zone migration from Pueblo Canyon.	Regional	C	A	—	—	—	A	—	A	A	—	A	
APCO-1	APCO-1	Pueblo	Monitors within the wetland below the Pueblo WWTP. Most downcanyon monitoring point in Pueblo Canyon.	Alluvial	C	A	—	—	—	A	—	A	A	—	A	
POI-4	POI-4	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons sources.	Intermediate	C	A	—	—	—	A	—	A	A	—	A	
R-3i	R-3i	Pueblo	Monitors along the potential infiltration pathway originating in lower Pueblo Canyon.	Intermediate	C	A	A	A	—	A	—	A	A	—	A	

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	**Organics**			**Radionuclides**		**Inorganics**			**Field**[j]
Old Location Name	**New Location Name**	**Watershed**	**Comment**	**Zone**	**Water Level or Flow**[a]	**Metals (Filtered)**[b]	**VOCs**[c]	**SVOCs**[c]	**HEXP**[d]	**Radionuclide**[e]	**Tritium**[f]	**Gen Inorganics**[g]	**Perchlorate**[h]	**Suspended Sed**[i]	**DO, ORP, pH, SC, T, Turb**
TW-2Ar	TW-2Ar	Pueblo	Replacement monitoring well for TW-2A. Monitors perched-intermediate groundwater in lower Pueblo Canyon. Completed March 4, 2010.	Intermediate	C	A	—	—	—	A	A	A	A	—	A
R-2	R-2	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons. Background location in GBIR R4.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-3	R-3	Pueblo	Located in Pueblo Canyon, near the eastern boundary of TA-74. Monitors potential contaminant flow paths near municipal production well Otowi 1. Completed June 21, 2010.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-4	R-4	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-24	R-24	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons and Guaje Canyon. Background location in GBIR R4.	Regional	C	A	—	—	—	A	—	A	A	—	A

Table 8.3-1 (continued)

						Analytical Suites										
						Metals	Organics			Radionuclides		Inorganics			Field[j]	
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
Los Alamos Canyon near Otowi Bridge (E110)	LA Canyon near Otowi Bridge	Lower Los Alamos Canyon	Measures quality of persistent surface water in Los Alamos Canyon above the confluence of Los Alamos Canyon and Rio Grande. Located on San Ildefonso land and sampled under the MOU.	Base flow	A	A	A	A	T	A	—	A	A	A	A
Basalt Spring/Vine Tree Spring	Basalt Spring	Lower Los Alamos Canyon	Basalt Spring water quality indicates a relation to perched-intermediate groundwater in lower Pueblo Canyon. Located on San Ildefonso land immediately downgradient of the Laboratory boundary and sampled under the MOU. Sample Basalt Spring; if not possible, sample Vine Tree Spring.	Spring	S	S	S	T	T	S	—	S	S	S	S
Los Alamos Spring	Los Alamos Spring	Lower Los Alamos Canyon	Los Alamos Spring water quality indicates a relation to perched-intermediate groundwater, possibly originating beneath Los Alamos Canyon. Located on San Ildefonso land and sampled under the MOU.	Spring	A	A	A	T	T	A	—	A	A	A	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
LLAO-1b	LLAO-1b	Lower Los Alamos Canyon	Monitors upper portion of San Ildefonso Pueblo reach in lower Los Alamos Canyon. Water quality is consistent with recharge of water that emerges at Basalt Spring. Located on San Ildefonso land and sampled under the MOU.	Alluvial	C	A	A	T	T	A	—	A	A	—	A
LLAO-4	LLAO-4	Lower Los Alamos Canyon	Monitors lower San Ildefonso Pueblo reach in lower Los Alamos Canyon near the confluence with Rio Grande. Water quality appears to reflect mixing with regional groundwater near the Rio Grande. Located on San Ildefonso land and sampled under the MOU.	Alluvial	C	A	A	T	T	A	—	A	A	—	A
SCA-2	SCA-2	Sandia	Located at the upper portion of the lower canyon where the valley floor first opens up and the first significant alluvial storage is present along the canyon.	Alluvial	C^{MP}	A	—	—	—	A	—	A	A	—	A
R-12 screen 1	R-12 S1	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	C	A	—	—	—	A	—	A	A	—	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	**New Location Name**	**Watershed**	**Comment**	**Zone**	**Water Level or Flow[a]**	**Metals (Filtered)[b]**	**VOCs[c]**	**SVOCs[c]**	**HEXP[d]**	**Radionuclide[e]**	**Tritium[f]**	**Gen Inorganics[g]**	**Perchlorate[h]**	**Suspended Sed[i]**	**DO, ORP, pH, SC, T, Turb**
R-12 screen 2	R-12 S2	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	C	A	—	—	—	A	—	A	A	—	A
R-10 screen 1	R-10 S1	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	C	A	A	A	T	A	—	A	A	—	A
R-10 screen 2	R-10 S2	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	C	A	A	A	T	A	—	A	A	—	A
R-10a	R-10a	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU.	Regional	C	A	A	A	T	A	—	A	A	—	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
CDBO-6	CDBO-6	Mortandad	Located in a small spatially limited saturated zone below Cañada del Buey in shallow bedrock. Monitors infiltration of runoff through the canyon floor.	Alluvial	C	A	—	—	—	A	—	A	A	—	A
MCO-5	MCO-5	Mortandad	Monitors trends in alluvial groundwater quality following upgrades to the RLWTF.	Alluvial	C	A	—	—	—	A	A	A	A	—	A
MCO-7	MCO-7	Mortandad	Near recent downcanyon extent of alluvial saturation. Monitors trends in alluvial groundwater quality following upgrades to the RLWTF. Monitoring required for RLWTF Discharge Permit DP-1132.	Alluvial	C	A	—	—	—	A	A	A	A	—	A
R-16 screen 2	R-16 S2	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-16 screen 4	R-16 S4	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north.	Regional	C	A	—	—	—	A	—	A	A	—	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
R-16r	R-16r	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north. Replaces screen 1 in R-16. Background location in GBIR R4.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-33 screen 1	R-33 S1	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-33 screen 2	R-33 S2	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	C	A	—	—	—	A	—	A	A	—	A
R-34	R-34	Mortandad	Monitors regional groundwater for potential contaminants originating beneath Los Alamos, Sandia, or Mortandad Canyons. Key monitoring location for San Ildefonso and Buckman Well Field. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	C	Q	A	A	T	A	—	Q	A	—	Q
Bulldog Spring	Bulldog Spring	Pajarito	Monitors HE contamination downgradient of TA-09.	Spring	A	A	—	—	A	A	—	A	A	A	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
18-MW-18	18-MW-18	Pajarito	Part of a group of alluvial wells within the former TA-18 complex. Monitoring point for potential releases associated with historical sewage lagoons on lower Pajarito Canyon.	Alluvial	C^{MP}	A	—	—	A	A	—	A	A	—	A
PCAO-8	PCAO-8	Pajarito	Characterizes potential impacts from runoff associated with TA-54 near PCTH-5 (between PCO 2 and PCO-3).	Alluvial	C	A	—	—	A	A	—	A	A	—	A
03-B-13	03-B-13	Pajarito	Near TA-03, building SM-30. Monitored in support of project at SWMU 03-010(a).	Intermediate	C	S	S	S	A	A	A	S	A	—	S
R-19 screen 2	R-19 S2	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas, including TA-54.	Intermediate	C	A	—	—	A	A	—	A	A	—	A
PCI-2	PCI-2	Pajarito	Monitors perched-intermediate groundwater at the confluence of Twomile and Pajarito Canyons. Provides baseline characterization data for areas upgradient of TA-54. Background location in GBIR R4.	Intermediate	C	A	—	—	A	A	—	A	A	—	A

Table 8.3-1 (continued)

						Analytical Suites									
						Metals	Organics			Radionuclides		Inorganics			Field[j]
Old Location Name	New Location Name	Watershed	Comment	Zone	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs[c]	SVOCs[c]	HEXP[d]	Radionuclide[e]	Tritium[f]	Gen Inorganics[g]	Perchlorate[h]	Suspended Sed[i]	DO, ORP, pH, SC, T, Turb
R-17 screen 1	R-17 S1	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	C	A	—	—	A	A	—	A	A	—	A
R-17 screen 2	R-17 S2	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	C	A	—	—	A	A	—	A	A	—	A
R-19 screen 3	R-19 S3	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Regional	C	A	—	—	A	A	—	A	A	—	A
R-19 screen 4	R-19 S4	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Regional	C	A	—	—	A	A	—	A	A	—	A
WCO-1r	WCO-1r	Water	Replacement well for MCO-1.	Alluvial	C	A	—	—	A	A	—	A	A	—	A
R-31 screen 4	R-31 S4	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	C	A	—	—	A	A	—	A	A	—	A
R-31 screen 5	R-31 S5	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	C	A	—	—	A	A	—	A	A	—	A

Table 8.3-1 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals, anions, and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. The superscript MP indicates water levels will be monitored at highly frequent intervals using a multiparameter probe that measures specific conductance, water level, and temperature. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[e] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[f] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[g] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[h] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[i] Suspended sed = Suspended sediment concentration.

[i] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

[k] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 8.3-2
Interim Monitoring Plan for White Rock Canyon and Rio Grande Watershed

Location	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites														
				Metals	Organics						Radionuclides			Inorganics				Field[l]
				Metals[b]	VOCs[c]	SVOCs[c]	Pesticides	PCB[d]	HEXP[e]	Dioxins/Furans	Radionuclide[f]	Tritium[g]	Low-Level Tritium[g]	Gen Inorganics[h]	Perchlorate[i]	Stable Isotopes[j]	Suspended Sed[k]	DO, ORP, pH, SC, T, Turb, ALK
Ancho at Rio Grande	Historical annual sampling site. Monitors base flow from Ancho at Rio Grande. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	A	A	A	T	T	T	T	T	A	—[m]	—	A	A	—	A	A
Frijoles at Rio Grande	Perimeter station for the Laboratory. Sampled in fall, during White Rock and Rio Grande watershed sampling event. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	A	A	A	T	T	T	T	T	A	—	—	A	A	—	A	A
Mortandad at Rio Grande	Located on San Ildefonso land and sampled under the MOU. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	A	A	A	A	T	A	A	T	A	—	A	A	A	—	A	A

Table 8.3-2 (continued)

Location	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites														
				Metals	Organics						Radionuclides			Inorganics				Field[l]
				Metals[b]	VOCs[c]	SVOCs[c]	Pesticides	PCB[d]	HEXP[e]	Dioxins/Furans	Radionuclide[f]	Tritium[g]	Low-Level Tritium[g]	Gen Inorganics[h]	Perchlorate[i]	Stable Isotopes[j]	Suspended Sed[k]	DO, ORP, pH, SC, T, Turb, ALK
Pajarito at Rio Grande	Monitors base flow from Pajarito at the Rio Grande. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	A	A	A	T	T	T	T	T	A	—	—	A	A	—	A	A
Rio Grande at Frijoles	Monitors base flow in the Rio Grande at Frijoles Canyon.	Base flow	A	A	A	T	T	T	T	T	A	—	—	A	A	—	A	A
Rio Grande at Otowi Upper	Monitors base flow in the Rio Grande at Otowi Bridge. Located on San Ildefonso land and sampled under the MOU.	Base flow	A	A	A	A	T	A	A	T	A	—	A	A	A	—	A	A
La Mesita Spring	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU.	Spring	A	A	A	T	T	T	T	T	A	—	A	A	A	—	A	A
Sacred Spring	Off-site spring that monitors regional aquifer downgradient of the Laboratory. Background location. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	T	T	T	T	T	A	—	A	A	A	—	A	A
Sandia Spring	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Spring	A	A	A	T	T	T	T	T	A	—	A	A	A	—	A	A

Table 8.3-2 (continued)

Location	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites														
				Metals	Organics						Radionuclides			Inorganics				Field[l]
				Metals[b]	VOCs[c]	SVOCs[c]	Pesticides	PCB[d]	HEXP[e]	Dioxins/Furans	Radionuclide[f]	Tritium[g]	Low-Level Tritium[g]	Gen Inorganics[h]	Perchlorate[i]	Stable Isotopes[j]	Suspended Sed[k]	DO, ORP, pH, SC, T, Turb, ALK
Spring 1	Monitors regional aquifer downgradient of the Laboratory. Background location. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	T	T	T	T	T	A	—	A	A	A	—	A	A
Spring 2	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU.	Spring	A	A	A	T	T	T	T	T	A	—	A	A	A	—	A	A
Spring 2B	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 3	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 3A	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 3AA	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 4	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 4A	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 4AA	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 4B	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A

Table 8.3-2 (continued)

				Analytical Suites														
				Metals	Organics						Radionuclides			Inorganics				Field[l]
Location	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals[b]	VOCs[c]	SVOCs[c]	Pesticides	PCB[d]	HEXP[e]	Dioxins/Furans	Radionuclide[f]	Tritium[g]	Low-Level Tritium[g]	Gen Inorganics[h]	Perchlorate[i]	Stable Isotopes[j]	Suspended Sed[k]	DO, ORP, pH, SC, T, Turb, ALK
Ancho Spring	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 5	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 5A	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 5B	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 6	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 6A	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 8A	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A
Spring 9	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A

Table 8.3-2 (continued)

Location	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites														
				Metals	Organics						Radionuclides			Inorganics				Field[l]
				Metals[b]	VOCs[c]	SVOCs[c]	Pesticides	PCB[d]	HEXP[e]	Dioxins/Furans	Radionuclide[f]	Tritium[g]	Low-Level Tritium[g]	Gen Inorganics[h]	Perchlorate[i]	Stable Isotopes[j]	Suspended Sed[k]	DO, ORP, pH, SC, T, Turb, ALK
Spring 9A	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	
Spring 9B	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	A	T	T	A	T	A	—	A	A	A	—	A	A

Table 8.3-2 (continued)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); T= triennial (1 time every 3 yr). Some locations may be assigned analytical suites or frequencies that differ from those indicated for the general surveillance monitoring group in Table 1.6-3 for site-specific reasons summarized in Table D-8.8-3.

Nonfiltered and filtered samples will be collected for general inorganics (excluding anions) and metals. Anions and perchlorate samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only for all water media. Organic and HEXP constituents are nonfiltered for all water media. Stable isotope samples for nitrogen isotopes are filtered; stable isotope samples for deuterium and oxygen isotopes are not filtered.

[a] Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. The superscript MP indicates water levels will be monitored at highly frequent intervals using a multiparameter probe that measures specific conductance, water level, and temperature. The superscript HD indicates that this sampling location is historically dry.

[b] Metals analysis includes the 23 TAL metals, plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] VOC = Volatile organic compounds; SVOC = semivolatile organic compounds.

[d] PCB = Polychlorinated biphenyl (compound).

[e] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate (PETN); triaminotrinitrobenzene (TATB); 3,5-dinitroaniline, tri(o-cresyl)phosphate (TOCP); 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[f] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[g] Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[h] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[i] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[j] Analysis for stable nitrogen, deuterium, and oxygen isotopes. The collection of samples for stable isotopic analysis is considered a special sampling campaign that is outside the scope of the regulatory process. In general, samples for isotopic analysis are collected semiannually from “new” wells (those which completed construction, rehabilitation, or conversion on or after October 1, 2010) until at least four sets of data have been collected. Any subsequent sampling for stable isotope analysis will be decided on the basis of site-specific conditions.

[k] Suspended sed = Suspended sediment concentration.

[l] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. Oxidation-reduction potential (ORP) will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise. Alkalinity (ALK) will be measured for all samples either in the field or at the on-site EES-14 laboratory.

[m] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

ALK	alkalinity
AK	acceptable knowledge
AOC	area of concern
BCG	Biota Concentration Guides (DOE)
bgs	below ground surface
cfs	cubic feet per second
CFR	Code of Federal Regulations
CME	corrective measures evaluation
CMI	corrective measures implementation
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
CV	casing volume
DCG	Derived Concentration Guidelines (DOE)
DO	dissolved oxygen
DOE	Department of Energy (U.S.)
EES-14	Earth Systems Observations (Laboratory group)
EP	Environmental Programs (Directorate)
EPA	Environmental Protection Agency (U.S.)
F	filtered
FD	frequency of detection
FY	fiscal year
GBIR	Groundwater Background Investigation Report
GFM	geologic framework model
GW	groundwater
HE	high explosives (also HEXP)
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IDW	investigation-derived waste
Interim Plan	Interim Facility-Wide Groundwater Monitoring Plan
IR	investigation report
LANL	Los Alamos National Laboratory
MCL	maximum contaminant level
MDA	material disposal area
MDL	method detection limit

meq	milliequivalents
MOU	memorandum of understanding
MP	multiport system (Westbay)
MY	monitoring year
NIST	National Institute of Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
ORP	oxygen-reduction potential
PCB	polychlorinated biphenyl
PEB	performance evaluation blank
PETN	pentaerythritol tetranitrate
PMR	periodic monitoring report
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RACER	Risk Analysis, Communication, Evaluation, and Reduction (database)
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5,trinitro-1,3,5-triazine
RFI	RCRA facility investigation
RLWTF	Radioactive Liquid Waste Treatment Facility
RPF	Records Processing Facility
RSL	Regional Screening Level (EPA)
SC	specific conductance
SMO	Sample Management Office
SOP	standard operating procedure
SU	standard unit
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWSC	Sanitary Wastewater Systems Consolidation
SWWS	Sanitary Wastewater Systems
TA	technical area

TAL	target analyte list (EPA)
TATB	triaminotrinitrobenzene
TBD	to be determined
TCE	trichloroethene
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TNT	trinitrotoluene(2,4,6)
TNX	hexahydro-1,3,5-trinitroso-1,3,5-triazine
TOC	total organic carbon
TOCP	tri(o-cresyl)phosphate
TW	Test Well
UF	unfiltered
USGS	U.S. Geological Survey
USFS	U.S. Forest Service
VOC	volatile organic compound
WCSF	waste characterization strategy form
WWTP	waste water treatment plant

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Screening Information

B-1.0 OVERVIEW

Attachment B-1 to this appendix presents screening tables for groundwater and base-flow water-quality data used to optimize monitoring strategies for watersheds and area-specific monitoring groups in the Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan, prepared by Los Alamos National Laboratory (the Laboratory). Selection of the screening values for groundwater data follows the approach prescribed for the development of groundwater cleanup levels in Section VIII of the Compliance Order on Consent (the Consent Order). An analogous protocol is used to select screening values for base-flow surface-water data. The process used to select the cleanup levels from applicable standards or screening levels (Table B-1.0-1) is described in section B-2.0 for groundwater and section B-3.0 for base flow.

Groundwater and base-flow data from 2006 to 2010 are screened against one-half of the groundwater or base-flow cleanup level. Groundwater data are also screened against the Laboratory's groundwater background values (LANL 2007, 095817), where available.

The screening implemented in the tables (Attachment B-1 on CD) serves as a high-level screening tool consistent with U.S. Environmental Protection Agency (EPA) regulatory guidance (EPA 1996, 065402). The screening does not trigger actions or define unacceptable levels of contaminants in water. In this appendix, "screening" refers to identification of locations in a watershed or area-specific monitoring group where contaminant concentrations fall below screening levels and therefore do not require additional evaluation. On the other hand, where contaminant concentrations exceed a screening level, additional evaluation may be needed to determine actions. The screening levels include assumptions—such as residential land-use scenarios—that are protective for a wide range of site conditions but are generally more stringent than site-specific levels.

Attachment B-1 (on CD) presents screening tables organized by the six area-specific monitoring groups plus the general surveillance monitoring group in seven watersheds. Within each watershed or area-specific monitoring group, these screening tables are organized by analytical suite for each water type sampled. Groundwater types include springs, alluvial groundwater, intermediate-perched groundwater, and regional groundwater; surface water types are ephemeral and perennial base flow. Four screening tables are included in Attachment B-1:

- Table B1-1, Analytical Data Screening for Frequency of Detection in Each Watershed or Area-Specific Monitoring Group: Groundwater (Including Springs)
- Table B1-2, Analytical Data Screening for Frequency of Detection in Each Watershed or Area-Specific Monitoring Group: Base Flow
- Table B1-3, Analytical Data Screening for Frequency of Detection at Locations in Each Watershed or Area-Specific Monitoring Group: Groundwater (Including Springs)
- Table B1-4, Analytical Data Screening for Frequency of Detection at Locations in Each Watershed or Area-Specific Monitoring Group: Base Flow

For each water type in each watershed or area-specific monitoring group, the screening tables report statistics for analytes categorized by analytical suite, with statistics tabulated separately for filtered (F) and unfiltered (UF) samples:

- diesel range organics (DRO)
- dioxin/furans (DIOX/FUR)
- gasoline range organics (GRO)

- general inorganics (GENINORG)
- herbicides (HERB)
- high explosives (HEXP)
- metals (METALS)
- polychlorinated biphenyls (PCB)
- PCB congeners (PCB CONGENER or PCB CONG)
- pesticides (PEST)
- radioactivity (RAD)
- semivolatile organic analytes (SVOA)
- volatile organic analytes (VOA)

The list of analytical suites and water types compiled for individual watersheds or area-specific monitoring group varies according to the availability of sampling locations and analytical data in that watershed for 2006 to 2010, the period of time covered by these tables. Table columns in Tables B1-1 and B1-2 summarize the following types of information:

- Analyte—the name of the analyte screened
- Method—analytical method(s)
- Units—unit of measurement
- Number of analyses—number of analyses available for screening, preceded by the less-than symbol (<) if all of the available analyses are classified as not detected
- Number of Detects—number of values classified as detected
- Number of Nondetects—number of values classified as not detected
- Min, Mean, and Max—minimum, mean, and maximum of detected values (or if in italics, minimum, mean, and maximum of the minimum detection levels)
- BV—applicable numerical background value, if available, used for screening
- Number >BV—number of detections greater than the background value
- Std—numerical value for the groundwater or base-flow cleanup level used for screening, if available
- Number>Std—number of detected values greater than the groundwater or base-flow cleanup level
- 1/2 Std—one-half of the numerical value for the groundwater or base-flow cleanup level
- Number >1/2 Std—number of detected values greater than one-half the groundwater or base-flow cleanup level
- Std Type—a reference for the groundwater or base-flow cleanup level

Abbreviations used for standards and screening levels in the table column “Std Type” are provided in Table B-1.0-1.

B-2.0 PROTOCOL FOR SELECTING SCREENING LEVELS FOR GROUNDWATER DATA

Water quality data for groundwater (including springs) are compared to the groundwater cleanup levels, determined according to the process described in Section VIII of the Consent Order. The cleanup levels are selected from the lowest applicable standard or screening level (Table B-1.0-1):

- New Mexico Water Quality Control Commission (NMWQCC) Standards for Ground Water (20.6.2.3103 New Mexico Administrative Code [NMAC])
- EPA National Primary Drinking Water Regulations: maximum contaminant levels (MCLs) (40 Code of Federal Regulations [CFR] Part 141 through July 1, 2007)
- Consent Order groundwater screening level for perchlorate (Section VIII.A.1)
- U.S. Department of Energy (DOE) Derived Concentration Guidelines (DCGs) for radionuclides (ingested-water DCG based on a target limit of 4 mrem/yr) (DOE 5400.5, Figure III-1)

If no standard exists for a chemical analyte, groundwater data are compared against the EPA's Regional screening levels (RSLs) for tap water (EPA 2011, 204336). For compounds with screening levels based on cancer risk, the EPA's screening values in the RSL tables are based on a cancer risk of 10^{-6}. These risk levels are adjusted to a cancer risk of 10^{-5}, consistent with requirements in the Consent Order, by moving the decimal point one place to the right.

The screening process for groundwater also compares each analyte against background values for naturally occurring metals and general chemical parameters at or near the Laboratory. The background values for each groundwater zone (alluvial, intermediate, or regional) are from the groundwater background investigation report (LANL 2007, 094856; LANL 2010, 110535).

B-3.0 PROTOCOL FOR SCREENING BASE-FLOW SURFACE WATER DATA

The NMWQCC establishes surface water standards in the State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC). Certain reaches of watercourses may have specific classification and have segment-specific designated uses. The designated uses for surface water are associated with use-specific water-quality criteria, including numeric criteria. Nonclassified surface waters are described as ephemeral, intermittent, or perennial, each of which also has corresponding designated uses described in 20.6.4 NMAC.

The Laboratory's sitewide monitoring program includes base-flow stations in reaches that are assigned to different watercourse classifications in 20.6.4 NMAC, each of which has its own set of water-quality criteria. In addition, the Laboratory collects samples from surface waters under tribal regulatory jurisdiction. Although these waters are specifically excluded from state regulation (20.6.4.7[DD] NMAC), they are nonetheless included in the screening in this Interim Plan.

The base-flow monitoring locations are assigned to one of two screening categories—perennial or ephemeral (Table B-3.0-1). Along with a hardness value, this category determines the screening levels used for data at each monitoring location. Water-quality data from these locations are compared with the base-flow cleanup level, determined as the lowest numeric standard among the designated uses.

Hardness-dependent screening levels used to screen data at each base-flow monitoring location in the 2011 Interim Plan are the geometric mean of hardness data (mg/L as $CaCO_3$) collected since 2006 at each location (Table B-3.0-1). Hardness-dependent acute and chronic criteria for dissolved aluminum, cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc were used in accordance with the requirements of 20.6.4 NMAC.

Radionuclide data for ephemeral and perennial surface-water locations are compared with the DOE Biota Concentration Guides (BCGs) (DOE 2002, 085637), as modified by site-specific BCGs for selected radionuclides (McNaughton et al. 2008, 106501).

B-4.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the New Mexico Environment Department Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

DOE (U.S. Department of Energy), July 2002. "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota," DOE Standard No. DOE-STD-1153-2002, U.S. Department of Energy, Washington, D.C. (DOE 2002, 085637)

EPA (U.S. Environmental Protection Agency), April 1996. "Soil Screening Guidance: User's Guide," EPA/540/R-96/018, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1996, 065402)

EPA (U.S. Environmental Protection Agency), June 3011. "Regional Screening Level (RSL) Composite Table June 2011," Regional Screening Levels for Chemical Contaminants at Superfund Sites screening level/preliminary remediation goal website, tables available online at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm, Washington, D.C. (EPA 2011, 204336)

LANL (Los Alamos National Laboratory), May 2007. "Groundwater Background Investigation Report, Revision 3," Los Alamos National Laboratory document LA-UR-07-2853, Los Alamos, New Mexico. (LANL 2007, 095817)

LANL (Los Alamos National Laboratory), February 2007. "Groundwater Background Investigation Report, Revision 2," Los Alamos National Laboratory document LA-UR-07-0755, Los Alamos, New Mexico. (LANL 2007, 094856)

LANL (Los Alamos National Laboratory), August 2010. "Groundwater Background Investigation Report, Revision 4," Los Alamos National Laboratory document LA-UR-10-4827, Los Alamos, New Mexico. (LANL 2010, 110535)

McNaughton, M., P. Fresquez, and W. Eisele, May 2008. "Site-Representative Biota Concentration Guides at Los Alamos," Los Alamos National Laboratory document LA-UR-08-2783, Los Alamos, New Mexico. (McNaughton et al. 2008, 106501)

Table B-1.0-1
Potentially Applicable Standards Used to Select Screening Levels

Type	Source	Description	Abbreviation[a]	Potential Applicability					
				Perennial Surface Water		Ephemeral Surface Water		Groundwater (Includes Springs)	
				F	UF	F	UF	F	UF
NMWQCC									
Standard	NMAC 20.6.4	Livestock Watering	NM LVSTK WTR STD	X	X	X	X		
Standard	NMAC 20.6.4	Wildlife Habitat	NM WQCC WLDLF HAB		X		X		
Standard	NMAC 20.6.4	Aquatic Life Acute	NM Aqu Acute[b]			X	X		
Standard	NMAC 20.6.4	Aquatic Life Chronic	NM Aqu Chronic[b]	X	X				
Standard	NMAC 20.6.4	Human Health Standard	NM HH OO	X	X	X	X		
Standard	NMAC 20.6.2	Groundwater Human Health Standards, Other Standards for Domestic Water Supply and Standards for Irrigation Use	NM GW STD					X	X
Consent Order									
Screening Level	Consent Order	Screening Level for Perchlorate in Groundwater	NM GW CONS					X	X
EPA									
Standard	40 CFR 141	EPA maximum contaminant levels	EPA MCL					X	X
Risk—human	EPA RSLs[c]	EPA Regional Screening Levels for Tapwater	EPA TAP SCRN LVL					X	X
DOE									
Risk—ecological	DOE Order 5400.5	DOE Biota Concentration Guides	DOE BCG WATER	X	X	X	X		
Risk—human	DOE Order 5400.5	DOE 4-mrem Drinking Water Derived Concentration Guidelines	DOE DW DCG					X	X

[a] Abbreviations used here and in the screening tables in Attachment B-1.

[b] Hardness-dependent.

[c] EPA RSLs (EPA 2011, 204336).

Table B-3.0-1
Hardness Assignments Used to Select Screening Levels

Watershed	Location	Stream Type	Hardness (mg/L as $CaCO_3$)
Guaje	Guaje above Rendija	Ephemeral	40
Pueblo	Acid above Pueblo	Ephemeral	50
Pueblo	Pueblo 3	Ephemeral	80
Pueblo	Pueblo above Acid	Ephemeral	80
Pueblo	Pueblo above SR-502	Perennial	70
Los Alamos	DP above TA-21	Ephemeral	100
Los Alamos	DP below Meadow at TA-21	Ephemeral	100
Los Alamos	Los Alamos above DP Canyon	Ephemeral	50
Los Alamos	Los Alamos above SR-4	Ephemeral	60
Los Alamos	Los Alamos below Ice Rink	Perennial	40
Los Alamos	Los Alamos below LA Weir	Ephemeral	60
Los Alamos	Los Alamos Canyon near Otowi Bridge	Ephemeral	100
Sandia	Middle Sandia Canyon at terminus of persistent baseflow	Ephemeral	90
Sandia	Sandia below Wetlands	Perennial	100
Sandia	Sandia left fork at Asphalt Plant	Perennial	100
Sandia	Sandia right fork at Power Plant	Perennial	100
Sandia	South Fork of Sandia Canyon at E122	Ephemeral	100
Mortandad	E-1E	Ephemeral	90
Mortandad	E-1FW	Ephemeral	80
Mortandad	E-1W	Ephemeral	100
Mortandad	M-1E	Ephemeral	60
Mortandad	M-1W	Ephemeral	50
Mortandad	M-2E	Ephemeral	90
Mortandad	Mortandad below Effluent Canyon	Ephemeral	60
Mortandad	TS-1W	Ephemeral	60
Mortandad	TS-2E	Ephemeral	70
Pajarito	Pajarito 0.5 mi above SR-501	Perennial	30
Pajarito	Pajarito above Twomile	Ephemeral	50
Pajarito	Pajarito at Rio Grande	Ephemeral	70
Pajarito	Pajarito below confluences of South and North Anchor East Basin	Perennial	50
Pajarito	Pajarito below TA-18	Ephemeral	70
Pajarito	Two Mile Canyon below TA-59	Ephemeral	50
Pajarito	Twomile above Pajarito	Ephemeral	50
Water	Between E252 and Water at Beta	Perennial	50
Water	Canon de Valle below MDA P	Perennial	70
Water	Water above SR-501	Perennial	40
Water	Water at Beta	Perennial	50

Table B-3.0-1 (continued)

Watershed	Location	Stream Type	Hardness (mg/L as $CaCO_3$)
Ancho	Ancho at Rio Grande	Ephemeral	50
Frijoles	Frijoles at Rio Grande	Perennial	40
Frijoles	Rio de los Frijoles at Bandelier	Perennial	30
White Rock	Rio Grande at Otowi Bridge	Perennial	100
White Rock	Buckman Diversion SW	Perennial	100
White Rock	Mortandad at Rio Grande	Ephemeral	100
White Rock	Rio Grande at Frijoles	Perennial	100

Attachment B-1

Tables B1-1 to B1-4
(on CD included with this document)

Appendix C

Procedures, Methods, and Investigation-Derived Waste Management

C-1.0 PROCEDURES FOR MEASURING GROUNDWATER LEVELS AND COLLECTING WATER SAMPLES

This section summarizes Los Alamos National Laboratory (LANL or the Laboratory) standard operating procedures (SOPs) used to measure groundwater levels and to collect groundwater, base-flow, and spring samples. These procedures are listed in the table below and are summarized in subsequent sections. These (or equivalent) procedures (or equivalent) will be used during sampling activities conducted in accordance with the revised 2011 Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan).

Procedure Identifier	Procedure Title	Applicability
Measurement of Groundwater Levels		
SOP-5223	Manual Groundwater Level Measurements	Procedure for measuring depth to groundwater and determining groundwater elevation in a monitoring well or an open borehole
EP-DIV-SOP-10010 (supersedes SOP-5227, R0)	Pressure Transducer Installation, Removal, and Maintenance	Procedure to install, remove, and maintain pressure transducers to monitor and record water-level data in monitoring wells and piezometers
SOP-5226	Westbay Pressure Transducer Installation, Removal, and Maintenance	Procedure to install, remove, and maintain pressure transducers to monitor and record water-level data in Westbay monitoring wells
SOP-5230	Groundwater Level Data Processing	Procedure to review and validate groundwater level data obtained from pressure transducers
EP-DIV-SOP-20006 (supersedes SOP-5260)	Pressure Monitoring of Packer Systems in Monitoring Wells	Procedure for monitoring and maintenance of Baski sampling system packers and temporary packers installed in water wells
Collection of Groundwater Samples		
EP-DIV-SOP-20032 (supersedes SOP-5232, R1)	Groundwater Sampling	Procedure for sampling groundwater using a dedicated submersible pump, Baski sampling system, or a portable pump
SOP-5225	Groundwater Sampling Using Westbay MP System	Procedure for sampling groundwater using the Westbay multiport (MP) system
EP-ERSS-SOP-5061	Field Decontamination of Equipment	Procedure for field decontamination of equipment
SOP-06.03	Sampling for Volatile Organic Compounds in Groundwater	Procedure for collecting groundwater samples for volatile organic compound (VOC) analysis
Collection of Surface Water and Spring Samples		
SOP-5224	Spring and Surface Water Sampling	Procedure for sampling springs and surface water
Measuring Field Parameters		
ENV-DO-203	Field Water Quality Analyses	Procedure for measuring field analytical water-quality parameters
Sample Preparation, Preservation, and Transportation		
EP-ERSS-SOP-5059	Field Quality Control Samples	Procedure for collection of field quality control (QC) samples, including field duplicates, equipment rinsate blanks, and trip blanks
SOP-219	Sample Control and Field Documentation	Procedure for establishing and maintaining sample traceability using sample control and field documentation
EP-ERSS-SOP-5056	Sample Containers and Preservation	Procedure specifying sample containers, collection and preservation techniques, and holding times

Procedure Identifier	Procedure Title	Applicability
SOP-066	Filtering and Chemical Preservation of Water Samples	Procedure describes the process for the chemical preservation of storm water and groundwater samples
EP-ERSS-SOP-5057	Handling, Packaging, and Transporting Field Samples	Procedure for sample packaging and shipping
ENV-WQH-QP-029	Creating and Maintaining Chain of Custody	Procedure for generating an analytical request and maintaining chain of custody in the collection, management, and processing of water-quality samples
SOP-5255	Shipping of Environmental Samples by the WES SMO	Procedure for receiving, packaging, and shipping samples to analytical laboratories.
Field Activities Documentation		
SOP-5181	Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities	Procedure for documenting technical work and field activities in a notebook or logbook.
Waste Management		
SOP-5238	Characterization and Management of Environmental Program Waste	Procedure for characterizing and managing generated waste

C-2.0 SUMMARY OF FIELD INVESTIGATION METHODS

Method	Summary
General	The objective of this sampling program is to collect samples from wells, springs, or base-flow stations that are representative of physical and geochemical conditions in the targeted hydrogeologic unit. To meet this objective, sampling equipment, sampling methods, monitoring-well operation and maintenance, and sample-handling procedures are implemented such that the chemistry of the sample is not altered. The procedures summarized below have been developed to meet the above objective and to be consistent with the requirements of the Compliance Order on Consent.
Groundwater Level Measurements Referenced Procedures: • EP-DIV-SOP-10010, Pressure Transducer Installation, Removal, and Maintenance • SOP-5226, Westbay Pressure Transducer Installation, Removal and Maintenance • SOP-5223, Manual Groundwater Level Measurements • SOP-5230, Groundwater Level Data Processing	This summary applies to the collection of groundwater-level data. Groundwater levels are manually measured at predetermined intervals. Additionally, data is downloaded at wells with pressure transducers installed after each sampling event. Water levels cannot be manually measured in wells equipped with the Westbay sampling system; however, data from these wells are downloaded before and after each sampling event. Westbay transducers must be removed before sampling and reinstalled after each sampling event. Two methods are used to collect water-level data: • Pressure transducers are used to measure water levels in individual wells or well screens at specified intervals. Most wells sampled under the Interim Plan are monitored with pressure transducers. • Manual water-level measurements are routinely measured in wells not instrumented with pressure transducers. These measurements are also taken before purging and sampling alluvial wells. Manual water level measurements are also taken periodically to verify transducer readings. Data from pressure transducers are automatically recorded in a data logger for later retrieval and processing to calculate water levels. Information collected during manual water level measurements is documented on the Groundwater Level Measurement Form or Groundwater Level Project Field Form. Pressure transducers are periodically bench-tested to verify calibration.

<table>
<tr><th>Method</th><th>Summary</th></tr>
<tr>
<td>
Collection of Groundwater Samples Using Dedicated Submersible or Portable Pumping Systems
<p>Referenced Procedures:</p>

EP-DIV-SOP-20032 Groundwater Sampling
ENV-DO-203, Field Water Quality Analyses
EP-ERSS-SOP-5056, Sample Containers and Preservation
SOP-5238, Characterization and Management of Environmental Program Waste
SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical Field Activities

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<td>
<p>This summary applies to the use of an electric gear-driven Submersible Pump system, a bladder-pump system, a Bennett pump system, a Baski pump system, a hand-bailer system, and portable versions of the bladder pump and Bennett pump to sample wells.</p>

Wells are purged sufficiently before sample collection to ensure samples will be representative of formation water.
The pumping rate should be adjusted, if possible, during purging so that excessive drawdown does not occur. Field crews may have limited ability to restrict flow, depending on the pumping system. Turning off the pump while purging regional and intermediate wells should be avoided unless absolutely necessary. Instead, the pumping rate should be slowed to prevent drawdown into the screen, whenever possible.
The discharge rate is calculated either by using an in-line flow meter or by filling a bucket or bottle of known volume and dividing by the fill time. Flow rate is monitored at regular intervals during the purge, preferably once per casing volume and while the drop pipe is being cleared.
In general, a well may be sampled once the following criteria have been met (see EP-DIV-SOP-20032 or details):

❖ A minimum of one casing volume (CV) has been removed for alluvial wells and a minimum of three CVs (plus drop pipe) have been removed for intermediate or regional wells (unless otherwise requested)
❖ The field indicator parameters have stabilized within their allowable ranges (as listed below) for at least three consecutive measurements taken a minimum of 3 or 5 min apart.

<table>
<tr><th>Field Parameter</th><th>Stabilization Criteria
(Yeskis and Zavala 2002, 204429)</th></tr>
<tr><td>Turbidity</td><td>± 10% when turbidity is greater than 10 nephelometric turbidity units (NTUs)</td></tr>
<tr><td>Dissolved Oxygen</td><td>± 0.3 mg/L,</td></tr>
<tr><td>pH</td><td>± 0.1 Standard Unit (SU)</td></tr>
<tr><td>Specific Conductance</td><td>± 3%</td></tr>
<tr><td>Temperature</td><td>± 10% (per the Compliance Order on Consent)</td></tr>
</table>

Purge water is discharged under the notice of intent (NOI) with the New Mexico Environment Department (NMED) or containerized pending waste determination.
Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. All activities are documented in the field logbook and appropriate field forms.
Chain-of-custody seals are applied to each sample container before samples are transported from the site.
All samples are submitted to the Sample Management Office (SMO) and then shipped to the designated off-site analytical laboratory in a timely manner to allow the laboratory to conduct analyses within proper holding times.

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Method	Summary
Collection of Groundwater Samples Using Westbay System Referenced Procedures: • SOP-5225, Groundwater Sampling Using Westbay Sampling System • SOP-5226, Westbay Pressure Transducer Installation, Removal and Maintenance • ENV-DO-203, Field Water Quality Analyses • EP-ERSS-SOP-5056, Sample Containers and Preservation	This summary applies to the sampling of wells equipped with the Westbay multiport (MP) system, a multilevel groundwater monitoring system. Samples are collected using a dedicated closed-access tube with valved ports that provide access to multiple levels of a borehole through a single well casing. The Westbay system is designed to allow for sampling without purging under normal aquifer conditions and takes samples at an in situ pressure. • The Westbay MP system consists of casing components that are permanently installed in the final casing, portable pressure measurement and sampling probes, and specialized tools. • The sampling probes are lowered to a precise port depth from which the sample is collected. This sampling system is a non-purge system so no purge water is generated. • Samples are collected directly into the sampling probe's sample containers and are transferred into the appropriate sample containers as soon as possible. • Data collected during sampling, including port pressures and field parameters, are documented on the appropriate forms in SOP-5225. • The sample probe and sample containers are the only equipment or materials that are reused and are decontaminated between sampling each port, as described in SOP-5225. • Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. Samples are delivered to SMO and shipped to the designated off-site analytical laboratory in a timely manner to allow the samples to be analyzed within proper holding times.
Collection of Spring and Surface Water Samples Referenced Procedures: • ENV-DO-203, Field Water Quality Analyses • SOP-5224, Spring and Surface Water Sampling • EP-ERSS-SOP-5056, Sample Containers and Preservation • ENV-WQH-SOP-009, Operation and Maintenance of Stream Gauge Stations	This summary applies to collecting water-quality samples from base-flow sites and springs. • Permanent spring and base-flow sampling sites are usually identified by posts or gaging stations. However, this may not be possible at some sites. • Ideally, samples are collected from flowing water. In some cases, the samples may need to be collected from pooled or ponded water. Samples are collected far enough upstream of a confluence so the sample is not influenced by water from another stream. If there is any question about whether a representative sample can be collected, field personnel are instructed to contact the requestor before proceeding. • Samples may be collected using either the direct containment method, or by using a peristaltic pump. Filtered samples must be collected using a peristaltic pump. • Where both field conditions and flow conditions allow, take a discharge measurement using one of the methods outlined in SOP-5224. Discharge may be estimated where quantitative measurements are not possible. • Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. All activities are documented in the field logbook and appropriate field forms. • Samples are delivered to SMO and shipped to the designated off-site analytical laboratory in a timely manner to allow the samples to be analyzed within proper holding times.

Method	Summary
Sample Bottles and Preservation of Samples Referenced Procedure: • EP-ERSS-SOP-5056, Sample Containers and Preservation • SOP-066, Filtering and Chemical Preservation of Water Samples	This summary applies to requirements for sampling containers, sample pretreatment, and sample preservation requirements that are applicable to all water-quality samples. • All samples are collected in containers specifically prepared for that given parameter. • Sample containers are pre-cleaned to a 300 Series (I-Chem, ESS) and are commercially available through a number of vendors. • For filtered samples for the analysis of dissolved constituents, the following systems will be used: ❖ in-line 0.45-µm disposable filter capsules, ❖ in-line filter holders with 0.45-µm filter membranes, or ❖ in-line 0.02-µm disposable filter capsules (for samples requiring microfiltration only). • Samples are preserved in accordance with Attachment 1 to SOP-5056. Samples are preserved and pH tested immediately after collection.
Handling, Packaging, and Shipping of Samples Referenced Procedures: • EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples • SOP-5255, Shipping of Environmental Samples by the WES SMO	This summary applies to requirements for handling, packaging, and shipping of samples. • After all samples are collected and preserved, the sample containers are wiped off and custody tape is applied before packaging. • Samples for off-site analysis are transported to the SMO for shipment to off-site analytical laboratories. • The sampling personnel will coordinate with the SMO regarding shipment of all samples.
Sample Documentation Referenced Procedures: • SOP-219, Sample Control and Field Documentation • ENV-WQH-QP-028, Creating and Maintaining Chain-of-Custody • EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples • SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical Field Activities	This summary applies to requirements for documentation of sample collection. • The requested parameters, preservation and bottle type, chain-of-custody, required field parameters, and any other additional information are included on the analytical request generated from the database. • All sampling activities are documented in the field logbooks and appropriate field forms. • Chain of custody is documented on the analytical request form and signed to verify that the samples were not left unattended. • All field information, date and time of sample, purging and final field parameters, field conditions, and sampling personnel are included in the specific sampling method field sheets.

Method	Summary
Field Quality Assurance/Quality Control Samples Referenced Procedure: • ENV-WQH-QP-028, Creating and Maintaining Chain-of-Custody	Field quality assurance (QA)/QC samples are required by the Consent Order, and are discussed in detail in Appendix E. Field QA/QC samples to be collected are summarized below. • Field blanks are collected at a frequency of 10% of all samples collected. • Equipment rinsate blanks are collected at a minimum frequency of 1 per day when non-dedicated sampling equipment is used. • Field duplicates are collected at a rate of 10% of all samples by media type, with a minimum of one duplicate collected per sample batch. • Trip blanks are included with any coolers containing samples submitted for VOC analysis. • Performance evaluation blanks will be submitted on an as-needed basis to evaluate the reagent-grade water used for decontamination and preparation of blanks.

C-3.0 METHODS AND INSTRUMENTS USED FOR FIELD MEASUREMENTS

Field Parameter	Method Description	U.S. Environmental Agency—-Approved Methods	Primary Field Instrument(s)	Primary Flow-Through Cell Used/Type	Description
pH	Hydrogen ion, pH (pH units): electrometric measurement	EPA: Method 150.1 Standard Methods,* 4500-H$^+$ B Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for pH and temperature in the field using a flow-through cell during well purging and at the time of sample collection. The listed instrument is commercially available with a temperature sensor for automatic compensation. A calibration check is performed on the meter using the manufacturer's instructions with standard buffers traceable to National Institute of Standards and Technology (NIST) and recorded. Standards are purchased from commercial vendors.
Temperature	Temperature, thermometric (°C)	EPA: Method 170.1 Standard Methods, 2550 B Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for temperature concurrently with pH measurement in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation.
Specific Conductance	Electrical conductance (micromhos/cm at 25°C): Wheatstone bridge	EPA: Method 120.1 Standard Methods, 2510 B Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for specific conductance in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. A calibration check is performed on the meter using the manufacturer's instructions with standard buffers traceable to NIST and is recorded. Standards are purchased from commercial vendors.
Dissolved Oxygen	Oxygen, dissolved (mg/L): electrode	EPA: Method 360.1 Standard Methods, 4500-O G Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for dissolved oxygen in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. The meter is calibrated using the manufacturer's instructions and is recorded.

Field Parameter	Method Description	U.S. Environmental Agency-–-Approved Methods	Primary Field Instrument(s)	Primary Flow-Through Cell Used/Type	Description
Turbidity	NTU	EPA: Method 180.1 Standard Methods, 2130 B Editions 18th, 19th, 20th	Hach 2100P, YSI 650 Handheld Multiparameter Instrument	Single sample aliquot application	Samples will be analyzed for turbidity in the field using a single aliquot during well purging and at the time of sample collection. The listed instruments are commercially available, and a calibration check is performed on the meter using the manufacturer's instructions. The YSI 650 Handheld Multiparameter Instrument serves as a back-up in case the primary instrument fails.
Oxidation Reduction Potential	Reduction-oxidation potential (mV): electrode method	Standard Methods, 2580 A Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for oxidation-reduction potential in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. A calibration check is performed on the meter using the manufacturer's instructions and is recorded.

* "Standard Methods" refers to editions of the Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association (Washington, D.C.).

C-4.0 ANALYTICAL METHODS—GROUNDWATER ANALYTICAL SUITES

C-4.1 Analyses by Accredited Contract Laboratories

Samples for laboratory analysis are submitted to accredited contract laboratories. The contract laboratories are required to establish method detection limits (MDLs) and practical quantitation limits (PQLs) for target analytes.

The MDL is the minimum concentration of an analyte that can be measured and reported with a 99% confidence that the concentration is greater than zero, as determined by the procedure set forth at Appendix B of 40 Code of Federal Regulations Part 136. The MDL is based on prepared spiked samples that go through the entire sample preparation scheme before they are analyzed. Most often, the MDL samples are analyzed by the contract laboratories under ideal conditions when the analytical instrumentation has been recently serviced, cleaned, and calibrated.

The PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during *routine* laboratory operating conditions using approved U.S. Environmental Protection Agency (EPA) methods. In most cases the contract laboratories define the low spike on their initial calibration curve as the PQL. Generally, the PQL is 3 to 5 times higher than the MDL and should not be more than 10 times the MDL.

Tables C-4.1-1 and C-4.1-2 provide the mode (that is, most frequent value) for MDL and PQLs reported for 2010 analyses of groundwater and base-flow samples for the Laboratory by contract laboratories, organized by analytical suite and method. The number of sample analyses and detections (that is, results greater than the MDL) for the period from 2006 to 2010 are given. The tables include values for applicable cleanup and/or background levels for each analyte listed. The cleanup levels are derived as described in Appendix B-2.0, Protocol for Selecting Cleanup Levels. The background values are from the most recent NMED-approved report (LANL 2009, 106115, Table 4.2-3; NMED 2010, 109327).

A subset of Tables C-4.1-1 and C-4.1-2 appears in three tables that compare the PQLs with cleanup or background levels.

Table C-4.1-3 shows analytes with a PQL above the applicable groundwater cleanup level.

Table C-4.1-4 shows analytes with a PQL above the background values for alluvial, intermediate, and regional groundwater from Laboratory guidance (LANL 2009, 106115).

Table C-4.1-5 shows analytes with a PQL above the base-flow cleanup level.

Comments in these tables indicate the cases where the MDL is below the cleanup level for the analyte, thus meeting the Consent Order requirement (Section IX).

The background levels for seldom-detected analytes were based on the MDL. In some cases, background values were determined using data from an internal analytical laboratory. As a result of differences in analytical methods and variation of reported MDLs over time, some MDL values are slightly above a groundwater background level.

For comparison, the lowest of background values for intermediate and regional groundwater identified in the Groundwater Background Investigation Report, Revision 4 (LANL 2010, 110535) are also shown in Table C-4.1-4. These background values are substantially higher for several analytes.

For most of the organic compounds where the MDL is higher than the cleanup level, the compound has seldom or never been detected in years of water samples, as indicated in Table C-4.1-3 for groundwater and Table C-4.1-5 for base flow.

The analytical services provided under contract to the Laboratory meet EPA requirements. Based on EPA 530-R-09-007 Unified Guidance (p. 2-7), “Any practical quantification limit (PQL) approved by the Regional Administrator under §264.97(h) [or §258.53(g)] that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions available to the facility.”

The Laboratory’s primary analytical services provider is GEL Laboratories, LLC. GEL’s client base includes 15 U.S. Department of Energy sites, 8 districts of the U.S. Army Corps of Engineers, the southern division of the U.S. Navy, several of the largest industrial manufacturers in southeastern U.S., and over 50 nuclear power plants in the U.S.

For the few instances where MDLs for analytes are higher than the cleanup levels for results reported in 2010, the MDLs are based on routine laboratory operating conditions available to the Laboratory. Most of these cases involve volatile or semivolatile organic compounds analyzed by EPA Methods SW-846:8260B and SW-846:8270C. Eighty compounds are analyzed by volatile organic Method SW-846:8260B. Of these 80 compounds, 67 have groundwater cleanup levels, and in 61 of these cases the MDL is below the cleanup level. The Laboratory also receives 80 analytes analyzed by semivolatile organic Method SW-846:8270C. Of these 80 compounds, 69 have groundwater cleanup levels, and in 55 of these cases the MDL is below the cleanup level.

C-4.2 Analyses by On-Site Laboratories

Regulatory analyses that support Laboratory’s characterization, cleanup, and monitoring programs are provided by external contract analytical laboratories. However, in some specific situations, samples are most appropriately submitted for on-site analysis by the Geochemistry and Geomaterials Research Laboratories (GGRL) in the Laboratory’s Earth Systems Observations Group (EES-14). In-house analyses are often used in the following cases:

- When rapid turnaround data (e.g., less than 24 h) are required to support activities such as drilling, well development, or well rehabilitation. Such rapid turnaround analyses are unavailable (at reasonable cost) from external laboratories.
- When special studies are undertaken to develop and refine conceptual models for contaminant transport in the environment. Examples of such studies are stable isotope analyses and filtration studies.
- When a well screen is impacted by residual effects of drilling and construction and is not producing reliable or representative water-quality data that fully meet monitoring objectives.

Table C-4.2-1 lists the analytical methods, PQLs, and MDLs for analytes reported by GGRL in recent data packages submitted to the Laboratory. The analytical methods used by GGRL are the most recent EPA and industry-accepted extraction and analytical methods for chemical analyses of these analytes.

C-5.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

This section describes how investigation-derived waste (IDW) generated during the groundwater monitoring activities conducted under this Interim Plan will be managed. IDW is waste generated as a result of field-investigation activities and may include, but is not limited to, purge water, contact waste, decontamination fluids, and all other wastes that has potentially come into contact with contaminants. IDW generated during implementation of the Interim Plan will be managed to protect human health and the environment, comply with applicable regulatory requirements, and adhere to Laboratory waste minimization goals.

All IDW generated during groundwater-monitoring activities will be managed in accordance with applicable Environmental Programs Directorate SOPs, which incorporate the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory requirements. The SOP applicable to the characterization and management of IDW is

- SOP-5238, Characterization and Management of Environmental Program Waste, available at http://www.lanl.gov/environment/all/qa/adep.shtml.

The Los Alamos National Security, LLC, Hazardous Waste Minimization Plan (LANL 2009, 109324) will be implemented during groundwater monitoring to minimize waste generation. This document is updated annually as a requirement of Permit Section 2.9 of the Laboratory's Hazardous Waste Facility Permit.

The IDW waste streams associated with groundwater monitoring are identified in the table below and are briefly described below. The estimated volumes of these waste streams that may be generated during the implementation of this Interim Plan are summarized in Table C-5.0-1.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of SOP-5238. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation or by direct sampling of the IDW or the media being investigated (e.g., groundwater, surface soil, subsurface soil). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of hazardous waste from a listed source are identified, a "contained in" determination may be submitted for approval to NMED.

Wastes will be containerized and placed in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before the waste is generated. Transportation and disposal requirements will also be detailed in the WCSF and approved before waste is generated.

Waste Determinations

The number of sampling events needed to make Resource Conservation and Recovery Act (RCRA) waste determinations will be based on acceptable knowledge (AK) of groundwater conditions within a watershed at the well or surface sample location. AK includes a review of historical information and process knowledge to identify whether hazardous waste, from a listed source, may be present (i.e., due diligence reviews).

The number of sampling events needed to make the waste determination for a given location is summarized as follows:

- For locations where existing AK demonstrates no RCRA hazardous waste or hazardous constituents above RCRA regulatory limits, a minimum of one sampling event will be used annually to confirm the nonhazardous waste determination. This waste determination will be reevaluated with data from subsequent sampling campaigns.
- For new wells with no existing AK, two consecutive sampling events will be conducted to ensure reproducibility and to establish reliable AK. Wastes generated during the first sampling event will be characterized by the data collected during the event. These wastes will be managed in accordance with the regulatory classification.
- For locations where RCRA hazardous constituents are suspected to exhibit a characteristic or sporadic, but not confirmed, the waste will initially be managed as hazardous. Once data is received from the first sampling event, waste will be managed and disposed of according to the analytical results. Waste generated from subsequent sampling events will be managed using AK from previous events until analytical data is available.

For new locations at or near a known listed hazardous waste source, that does not have a “contained in” determination, waste will be managed as hazardous until a due diligence can be performed. If a listed hazardous waste source is identified and low levels of listed hazardous waste constituents are detected, a “contained in” determination may be submitted to NMED for approval.

- For locations where IDW has been identified as RCRA hazardous waste, subsequent IDW generated at the location will be managed as hazardous waste until the data from four consecutive sampling events contain no RCRA hazardous waste or hazardous constituents above RCRA regulatory limits. At this point, the waste will be managed as nonhazardous.

Where RCRA constituents are detected, the following steps may be taken to complete the waste determination:

- Where duplicate groundwater samples are collected during the same sampling event and one is a nondetect and the other is detected, the Laboratory assumes the detection is the result of laboratory or field contamination. The detection will not be used for waste determination.
- When an F-, U-, P-, or K-listed contaminant is detected, the sources contributing to the watershed will be evaluated (i.e., due diligence reviews). If there is no documentation that these contaminants are from listed processes, the waste will be managed as nonhazardous.
- Sampling purge water will be managed in accordance with the most current version of ENV-RCRA-SOP-010, Land Application of Groundwater, as amended by the NMED-approved LANL Drilling, Development, Rehabilitation and Sampling Purge Water Decision Tree—Revised 03/12/2010 (NMED 2010, 109025).

Waste Management

Purge water: This waste stream consists of water purged from wells before and during sampling. The management of nonhazardous purge water will comply with ENV-RCRA-SOP-010, Land Application of Groundwater. If the purge water is hazardous, it will be managed in accordance with hazardous waste management requirements.

Purge water will be characterized based on the results of the analysis of water samples from the well from which the purge water originated or by direct sampling and analysis of the purge water. Purge water will be land applied if it meets the criteria in the NMED-approved NOI for land application of groundwater.

Contact waste: The contact waste stream consists of potentially contaminated wastes that “contacted” purge water during sampling. This waste stream consists primarily of, but is not limited to, personal protective equipment such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will be performed through AK from analytical results for the environmental media (i.e., purge water) with which it came into contact or direct sampling of the containerized waste and a review of any potentially RCRA Hazardous Listed Waste sources. The Laboratory expects most of these contact wastes will be nonhazardous waste that will be disposed of at a New Mexico solid waste landfill or low-level waste that will be disposed of at Area G at Technical Area 54 (TA-54).

Decontamination fluids: The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (i.e., decontamination solutions and rinse waters). Consistent with waste minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation. The decontamination fluids will be characterized through AK of the waste materials, the levels of contamination observed in the environmental media (e.g., purge water) and, if necessary, direct sampling of the containerized waste. The Laboratory expects most of these wastes to be nonhazardous liquid waste or radioactive liquid waste that will be sent to one of its wastewater treatment facilities or a LANL approved offsite treatment facility.

C-6.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate’s Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), May 2007. “Groundwater Background Investigation Report, Revision 3,” Los Alamos National Laboratory document LA-UR-07-2853, Los Alamos, New Mexico. (LANL 2007, 095817)

LANL (Los Alamos National Laboratory), May 2009. “2009 Interim Facility-Wide Groundwater Monitoring Plan,” Los Alamos National Laboratory document LA-UR-09-1340, Los Alamos, New Mexico. (LANL 2009, 106115)

LANL (Los Alamos National Laboratory), November 2009. “Los Alamos National Security, LLC, Hazardous Waste Minimization Plan,” Los Alamos National Laboratory document LA-UR-09-07682, Los Alamos, New Mexico. (LANL 2009, 109324)

LANL (Los Alamos National Laboratory), August 2010. “Groundwater Background Investigation Report, Revision 4,” Los Alamos National Laboratory document LA-UR-10-4827, Los Alamos, New Mexico. (LANL 2010, 110535)

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Table C-4.1-1
Analytes, Analytical Methods, and MDLs and PQLs Obtained for 2010 Analyses of Groundwater Samples by Contract Laboratories and Number of Sample Analyses and Detections for the Period 2006 to 2010

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	525	44	SW-846:8290		0.00005			µg/L	
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	525	91	SW-846:8290		0.00005			µg/L	
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	525	28	SW-846:8290		0.00005			µg/L	
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	525	0	SW-846:8290		0.00005			µg/L	
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	525	47	SW-846:8290		0.00005			µg/L	
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	525	1	SW-846:8290		0.00005			µg/L	
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	525	8	SW-846:8290		0.00005			µg/L	
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	525	11	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	525	4	SW-846:8290		0.00005			µg/L	
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	525	0	SW-846:8290		0.00005			µg/L	
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	525	32	SW-846:8290		0.00005			µg/L	
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	525	79	SW-846:8290		0.0001			µg/L	
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	525	35	SW-846:8290		0.0001			µg/L	
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	525	5	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	525	3	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	525	5	SW-846:8290		0.00005			µg/L	
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	525	26	SW-846:8290		0.00005			µg/L	
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	525	0	SW-846:8290		0.00001	0.00003		µg/L	EPA MCL
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	525	1	SW-846:8290		0.00001			µg/L	
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	525	1	SW-846:8290		0.00001			µg/L	
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	525	7	SW-846:8290		0.00001			µg/L	
DRO	TPH-DRO	Total Petroleum Hydrocarbons Diesel Range Organics	64	25	SW-846:8015M	65	200			µg/L	
Geninorg	ALK-CO3	Alkalinity-CO3	2678	351	EPA:310.1	0.73	1			mg/L	
Geninorg	ALK-CO3+HCO3	Alkalinity-CO3+HCO3	2680	2677	EPA:310.1	0.73	1		52	mg/L	
Geninorg	NH3-N	Ammonia as Nitrogen	2706	497	EPA:350.1	0.016	0.05		0.04	mg/L	
Geninorg	Br(-1)	Bromide	2699	669	EPA:300.0	0.066	0.2		0.03	mg/L	
Geninorg	Ca	Calcium	4761	4756	SW-846:6010B	0.05	0.2		17.3	mg/L	
Geninorg	Cl(-1)	Chloride	2733	2727	EPA:300.0	0.066	0.2	250	3.57	mg/L	NM GW STD
Geninorg	CN(TOTAL)	Cyanide (Total)	2169	222	EPA:335.4	0.0017	0.005	0.2		mg/L	EPA MCL
Geninorg	F(-1)	Fluoride	2748	2647	EPA:300.0	0.033	0.1	1.6	0.23	mg/L	NM GW STD
Geninorg	HARDNESS	Hardness	4733	4727	SM:A2340B	0.35	1.24			mg/L	

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Geninorg	Mg	Magnesium	4761	4748	SW-846:6010B	0.085	0.3		4.15	mg/L	
Geninorg	NO3+NO2-N	Nitrate-Nitrite as Nitrogen	2700	2343	EPA:353.2	0.01	0.05	10	0.57	mg/L	EPA MCL
Geninorg	C2O4	Oxalate	7	0	EPA:300.0	0.33	1			mg/L	
Geninorg	ClO4	Perchlorate	3364	2541	SW-846:6850	0.05	0.2	4	0.05	µg/L	NM GW CONS
Geninorg	pH	pH	2671	2671	EPA:150.1	0.01	0.1			SU	
Geninorg	K	Potassium	4761	4748	SW-846:6010B	0.05	0.15		2.63	mg/L	
Geninorg	Na	Sodium	4761	4756	SW-846:6010B	0.1	0.3		12.2	mg/L	
Geninorg	SO4(-2)	Sulfate	2731	2712	EPA:300.0	0.1	0.4	600	7.2	mg/L	NM GW STD
Geninorg	SSC	Suspended Sediment Concentration	502	245	EPA:160.2	0.76	3.33			mg/L	
Geninorg	TDS	Total Dissolved Solids	2708	2703	EPA:160.1	2.4	10	1000	127	mg/L	NM GW STD
Geninorg	TKN	Total Kjeldahl Nitrogen	3142	1084	EPA:351.2	0.033	0.1		0.04	mg/L	
Geninorg	TOC	Total Organic Carbon	2273	1898	SW-846:9060	0.33	1		0.33	mg/L	
Geninorg	PO4-P	Total Phosphate as Phosphorus	2606	821	EPA:365.4	0.015	0.05		0.05	mg/L	
Geninorg	TSS	Total Suspended Solids	116	65	EPA:160.2	2.3	10			mg/L	
GRO	TPH-GRO	Total Petroleum Hydrocarbons Gasoline Range Org	11	7	SW-846:8015M	11	50			µg/L	
Herb	94-75-7	D[2,4-]	388	0	SW-846:8151A	0.087	0.26	70		µg/L	EPA MCL
Herb	75-99-0	Dalapon	388	0	SW-846:8151A	1.3	5.3	200		µg/L	EPA MCL
Herb	94-82-6	DB[2,4-]	388	2	SW-846:8151A	0.087	0.26	290		µg/L	EPA TAP SCRN LVL
Herb	1918-00-9	Dicamba	388	0	SW-846:8151A	0.087	0.26	1100		µg/L	EPA TAP SCRN LVL
Herb	120-36-5	Dichlorprop	388	0	SW-846:8151A	0.087	0.26			µg/L	
Herb	88-85-7	Dinoseb	388	0	SW-846:8151A	0.087	0.26	7		µg/L	EPA MCL
Herb	94-74-6	MCPA	388	0	SW-846:8151A	12	53	18		µg/L	EPA TAP SCRN LVL
Herb	93-65-2	MCPP	388	0	SW-846:8151A	11	53	37		µg/L	EPA TAP SCRN LVL
Herb	93-76-5	T[2,4,5-]	388	0	SW-846:8151A	0.087	0.26	370		µg/L	EPA TAP SCRN LVL
Herb	93-72-1	TP[2,4,5-]	388	0	SW-846:8151A	0.087	0.26	50		µg/L	EPA MCL
Hexp	6629-29-4	2,4-Diamino-6-nitrotoluene	1739	17	SW-846:8321	0.39	1.3			µg/L	
Hexp	59229-75-3	2,6-Diamino-4-nitrotoluene	1739	9	SW-846:8321	0.39	1.3			µg/L	
Hexp	618-87-1	3,5-Dinitroaniline	1739	25	SW-846:8321	0.39	1.3			µg/L	
Hexp	19406-51-0	Amino-2,6-dinitrotoluene[4-]	1740	121	SW-846:8321	0.1	0.33	73		µg/L	EPA TAP SCRN LVL
Hexp	35572-78-2	Amino-4,6-dinitrotoluene[2-]	1740	97	SW-846:8321	0.1	0.33	73		µg/L	EPA TAP SCRN LVL
Hexp	99-65-0	Dinitrobenzene[1,3-]	1740	1	SW-846:8321	0.1	0.33	3.7		µg/L	EPA TAP SCRN LVL
Hexp	121-14-2	Dinitrotoluene[2,4-]	1740	14	SW-846:8321	0.1	0.33	2.2		µg/L	EPA TAP SCRN LVL
Hexp	606-20-2	Dinitrotoluene[2,6-]	1740	2	SW-846:8321	0.1	0.33	37		µg/L	EPA TAP SCRN LVL
Hexp	DNX	DNX	1234	42	SW-846:8330	0.069	0.5			µg/L	
Hexp	2691-41-0	HMX	1742	231	SW-846:8321	0.1	0.33	1800		µg/L	EPA TAP SCRN LVL
Hexp	MNX	MNX	1234	80	SW-846:8330	0.091	0.5			µg/L	
Hexp	98-95-3	Nitrobenzene	1740	2	SW-846:8321	0.1	0.33	1.2		µg/L	EPA TAP SCRN LVL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Hexp	88-72-2	Nitrotoluene[2-]	1740	7	SW-846:8321	0.1	0.33	3.1		µg/L	EPA TAP SCRN LVL
Hexp	99-08-1	Nitrotoluene[3-]	1740	1	SW-846:8321	0.1	0.33	3.7		µg/L	EPA TAP SCRN LVL
Hexp	99-99-0	Nitrotoluene[4-]	1740	0	SW-846:8321	0.1	0.65	42		µg/L	EPA TAP SCRN LVL
Hexp	78-11-5	PETN	1740	0	SW-846:8321	0.13	1.3			µg/L	
Hexp	121-82-4	RDX	1742	260	SW-846:8321	0.1	0.33	6.1		µg/L	EPA TAP SCRN LVL
Hexp	3058-38-6	TATB	1739	3	SW-846:8321	0.39	1.3			µg/L	
Hexp	479-45-8	Tetryl	1740	0	SW-846:8321	0.13	0.65	150		µg/L	EPA TAP SCRN LVL
Hexp	TNX	TNX	1234	43	SW-846:8330	0.082	0.5			µg/L	
Hexp	99-35-4	Trinitrobenzene[1,3,5-]	1740	54	SW-846:8321	0.1	0.33	1100		µg/L	EPA TAP SCRN LVL
Hexp	118-96-7	Trinitrotoluene[2,4,6-]	1740	42	SW-846:8321	0.1	0.33	22		µg/L	EPA TAP SCRN LVL
Hexp	78-30-8	Tris (o-cresyl) phosphate	1739	0	SW-846:8321	0.39	1.3			µg/L	
Metals	Al	Aluminum	4766	1573	SW-846:6010B	68	200	5000	68	µg/L	NM GW STD
Metals	Sb	Antimony	4757	130	SW-846:6020	0.5	3	6	0.5	µg/L	EPA MCL
Metals	As	Arsenic	4758	1054	SW-846:6020	1.5	5	10	4.32	µg/L	EPA MCL
Metals	Ba	Barium	4761	4747	SW-846:6010B	1	5	1000	56.8	µg/L	NM GW STD
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	µg/L	EPA MCL
Metals	B	Boron	4752	3373	SW-846:6010B	15	50	750	15.1	µg/L	NM GW STD
Metals	Cd	Cadmium	4756	183	SW-846:6020	0.11	1	5	1	µg/L	EPA MCL
Metals	Cr	Chromium	5093	3290	SW-846:6020	2.5	10	50	1	µg/L	NM GW STD
Metals	Co	Cobalt	4761	458	SW-846:6010B	1	5	50	0.5	µg/L	NM GW STD
Metals	Cu	Copper	4761	702	SW-846:6010B	3	10	1000	3	µg/L	NM GW STD
Metals	Fe	Iron	4766	2600	SW-846:6010B	30	100	1000	21	µg/L	NM GW STD
Metals	Pb	Lead	4756	857	SW-846:6020	0.5	2	15	0.5	µg/L	EPA MCL
Metals	Mn	Manganese	4766	2632	SW-846:6010B	2	10	200	2	µg/L	NM GW STD
Metals	Hg	Mercury	4732	103	EPA:245.2	0.066	0.2	2	0.06	µg/L	EPA MCL
Metals	Mo	Molybdenum	4730	2929	SW-846:6020	0.1	0.5	1000	2	µg/L	NM GW STD
Metals	Ni	Nickel	4756	3849	SW-846:6020	0.5	2	200	1	µg/L	NM GW STD
Metals	Se	Selenium	4756	269	SW-846:6020	1	5	50	6	µg/L	EPA MCL
Metals	SiO2	Silicon Dioxide	1718	1710	SW-846:6010B	0.053	0.213		50.7	mg/L	
Metals	Ag	Silver	4756	157	SW-846:6020	0.2	1	50	1	µg/L	NM GW STD
Metals	Sr	Strontium	4733	4728	SW-846:6010B	1	5	22000	120	µg/L	EPA TAP SCRN LVL
Metals	Tl	Thallium	4756	372	SW-846:6020	0.3	1	2	1	µg/L	EPA MCL
Metals	Sn	Tin	4733	84	SW-846:6010B	2.5	10	22000	3.26	µg/L	EPA TAP SCRN LVL
Metals	U	Uranium	4732	3954	SW-846:6020	0.05	0.2	30	0.72	µg/L	EPA MCL
Metals	V	Vanadium	4761	3819	SW-846:6010B	1	5	180	1	µg/L	EPA TAP SCRN LVL
Metals	Zn	Zinc	4763	2777	SW-846:6010B	3.3	10	10000	2	µg/L	NM GW STD
PCB	12674-11-2	Aroclor-1016	1170	1	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
PCB	11104-28-2	Aroclor-1221	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11141-16-5	Aroclor-1232	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	53469-21-9	Aroclor-1242	1170	5	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	12672-29-6	Aroclor-1248	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11097-69-1	Aroclor-1254	1171	9	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11096-82-5	Aroclor-1260	1170	8	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	37324-23-5	Aroclor-1262	1169	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
Pest	309-00-2	Aldrin	1229	4	SW-846:8081A	0.005	0.02	0.04		µg/L	EPA TAP SCRN LVL
Pest	319-84-6	BHC[alpha-]	1229	1	SW-846:8081A	0.005	0.02	0.11		µg/L	EPA TAP SCRN LVL
Pest	319-85-7	BHC[beta-]	1229	1	SW-846:8081A	0.006	0.02	0.37		µg/L	EPA TAP SCRN LVL
Pest	319-86-8	BHC[delta-]	1229	4	SW-846:8081A	0.005	0.02			µg/L	
Pest	58-89-9	BHC[gamma-]	1229	4	SW-846:8081A	0.005	0.02	0.2		µg/L	EPA MCL
Pest	5103-71-9	Chlordane[alpha-]	1229	0	SW-846:8081A	0.005	0.02			µg/L	
Pest	5103-74-2	Chlordane[gamma-]	1229	3	SW-846:8081A	0.005	0.02			µg/L	
Pest	72-54-8	DDD[4,4'-]	1229	14	SW-846:8081A	0.01	0.04	2.8		µg/L	EPA TAP SCRN LVL
Pest	72-55-9	DDE[4,4'-]	1229	15	SW-846:8081A	0.005	0.04	2		µg/L	EPA TAP SCRN LVL
Pest	50-29-3	DDT[4,4'-]	1229	8	SW-846:8081A	0.01	0.04	2		µg/L	EPA TAP SCRN LVL
Pest	60-57-1	Dieldrin	1229	8	SW-846:8081A	0.01	0.04	0.042		µg/L	EPA TAP SCRN LVL
Pest	959-98-8	Endosulfan I	1229	4	SW-846:8081A	0.005	0.02			µg/L	
Pest	33213-65-9	Endosulfan II	1229	5	SW-846:8081A	0.011	0.045			µg/L	
Pest	1031-07-8	Endosulfan Sulfate	1229	6	SW-846:8081A	0.01	0.04			µg/L	
Pest	72-20-8	Endrin	1229	5	SW-846:8081A	0.01	0.04	2		µg/L	EPA MCL
Pest	7421-93-4	Endrin Aldehyde	1229	3	SW-846:8081A	0.005	0.04			µg/L	
Pest	53494-70-5	Endrin Ketone	1229	0	SW-846:8081A	0.01	0.04			µg/L	
Pest	76-44-8	Heptachlor	1229	10	SW-846:8081A	0.005	0.02	0.4		µg/L	EPA MCL
Pest	1024-57-3	Heptachlor Epoxide	1229	3	SW-846:8081A	0.005	0.02	0.2		µg/L	EPA MCL
Pest	72-43-5	Methoxychlor[4,4'-]	1229	0	SW-846:8081A	0.05	0.2	40		µg/L	EPA MCL
Pest	8001-35-2	Toxaphene (Technical Grade)	1229	1	SW-846:8081A	0.15	0.5	3		µg/L	EPA MCL
Rad	Am-241	Americium-241	2578	61	Alpha Spectroscopy	0.05		1.2	0.04	pCi/L	DOE DW DCG
Rad	Cs-137	Cesium-137	2552	3	Gamma Spectroscopy	8		120	5.8	pCi/L	DOE DW DCG
Rad	Co-60	Cobalt-60	2552	0	Gamma Spectroscopy	8		200		pCi/L	DOE DW DCG
Rad	GROSSA	Gross alpha	1821	377	Gas Proportional Counting	3		15	2.98	pCi/L	EPA MCL
Rad	GROSSB	Gross beta	1817	1079	Gas Proportional Counting	3			4	pCi/L	
Rad	GROSSG	Gross gamma	2552	145	Gamma Spectroscopy	120			648	pCi/L	
Rad	Np-237	Neptunium-237	2649	1	Alpha Spectroscopy	0.05		1.2		pCi/L	DOE DW DCG
Rad	Pu-238	Plutonium-238	2551	18	Alpha Spectroscopy	0.05		1.6	0.06	pCi/L	DOE DW DCG
Rad	Pu-239/240	Plutonium-239/240	2551	57	Alpha Spectroscopy	0.05		1.2		pCi/L	DOE DW DCG

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Rad	K-40	Potassium-40	2552	12	Gamma Spectroscopy	10		280		pCi/L	DOE DW DCG
Rad	Ra-226	Radium-226	612	187	Gas Proportional Counting	1		4		pCi/L	DOE DW DCG
Rad	Ra-226	Radium-226	612	187	Alpha Spectroscopy	1		4		pCi/L	DOE DW DCG
Rad	Ra-228	Radium-228	615	216	Gas Proportional Counting	1		4		pCi/L	DOE DW DCG
Rad	Na-22	Sodium-22	2552	0	Gamma Spectroscopy	10		400		pCi/L	DOE DW DCG
Rad	Sr-90	Strontium-90	2585	184	Gas Proportional Counting	0.5		8	0.29	pCi/L	EPA MCL
Rad	Tc-99	Technetium-99	60	0	Gas Proportional Counting	1		4000		pCi/L	DOE DW DCG
Rad	Th-228	Thorium-228	163	16	Alpha Spectroscopy	0.05				pCi/L	
Rad	Th-230	Thorium-230	163	10	Alpha Spectroscopy	0.05				pCi/L	
Rad	Th-232	Thorium-232	163	21	Alpha Spectroscopy	0.05				pCi/L	
Rad	H-3	Tritium	2454	1197	Liquid Scintillation Counting	250		20000	0.32	pCi/L	EPA MCL
Rad	U-234	Uranium-234	2559	2177	Alpha Spectroscopy	0.05		20	0.18	pCi/L	DOE DW DCG
Rad	U-235/236	Uranium-235/236	2559	360	Alpha Spectroscopy	0.05		24		pCi/L	DOE DW DCG
Rad	U-238	Uranium-238	2559	2144	Alpha Spectroscopy	0.05		24	0.19	pCi/L	DOE DW DCG
SVOA	83-32-9	Acenaphthene	2074	2	SW-846:8270C	0.33	1.1	2200		µg/L	EPA TAP SCRN LVL
SVOA	208-96-8	Acenaphthylene	2074	3	SW-846:8270C	0.21	1.1			µg/L	
SVOA	62-53-3	Aniline	2074	0	SW-846:8270C	2.5	10	120		µg/L	EPA TAP SCRN LVL
SVOA	120-12-7	Anthracene	2074	4	SW-846:8270C	0.21	1.1	11000		µg/L	EPA TAP SCRN LVL
SVOA	1912-24-9	Atrazine	2074	0	SW-846:8270C	3	10	3		µg/L	EPA MCL
SVOA	103-33-3	Azobenzene	2074	0	SW-846:8270C	2	10	1.3		µg/L	EPA TAP SCRN LVL
SVOA	92-87-5	Benzidine	2074	0	SW-846:8270C	3	10	0.00094		µg/L	EPA TAP SCRN LVL
SVOA	56-55-3	Benzo(a)anthracene	2074	6	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	50-32-8	Benzo(a)pyrene	2074	9	SW-846:8270C	0.2	1	0.2		µg/L	EPA MCL
SVOA	205-99-2	Benzo(b)fluoranthene	2074	10	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	191-24-2	Benzo(g,h,i)perylene	2074	6	SW-846:8270C	0.2	1			µg/L	
SVOA	207-08-9	Benzo(k)fluoranthene	2074	9	SW-846:8270C	0.2	1	2.9		µg/L	EPA TAP SCRN LVL
SVOA	65-85-0	Benzoic Acid	2074	28	SW-846:8270C	6	20	150000		µg/L	EPA TAP SCRN LVL
SVOA	100-51-6	Benzyl Alcohol	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	111-91-1	Bis(2-chloroethoxy)methane	2074	0	SW-846:8270C	3	10	110		µg/L	EPA TAP SCRN LVL
SVOA	111-44-4	Bis(2-chloroethyl)ether	2074	0	SW-846:8270C	2	10	0.12		µg/L	EPA TAP SCRN LVL
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	2074	128	SW-846:8270C	2	10	6		µg/L	EPA MCL
SVOA	101-55-3	Bromophenyl-phenylether[4-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	85-68-7	Butylbenzylphthalate	2074	0	SW-846:8270C	2	10	350		µg/L	EPA TAP SCRN LVL
SVOA	59-50-7	Chloro-3-methylphenol[4-]	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	106-47-8	Chloroaniline[4-]	2074	0	SW-846:8270C	2	10	3.4		µg/L	EPA TAP SCRN LVL
SVOA	91-58-7	Chloronaphthalene[2-]	2074	2	SW-846:8270C	0.3	1	2900		µg/L	EPA TAP SCRN LVL
SVOA	95-57-8	Chlorophenol[2-]	2074	0	SW-846:8270C	2	10	180		µg/L	EPA TAP SCRN LVL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	218-01-9	Chrysene	2074	5	SW-846:8270C	0.2	1	29		µg/L	EPA TAP SCRN LVL
SVOA	53-70-3	Dibenz(a,h)anthracene	2074	4	SW-846:8270C	0.2	1	0.029		µg/L	EPA TAP SCRN LVL
SVOA	132-64-9	Dibenzofuran	2074	0	SW-846:8270C	2	10	37		µg/L	EPA TAP SCRN LVL
SVOA	95-50-1	Dichlorobenzene[1,2-]	2074	1	SW-846:8270C	2	10	600		µg/L	EPA MCL
SVOA	541-73-1	Dichlorobenzene[1,3-]	2074	16	SW-846:8270C	2	10			µg/L	
SVOA	106-46-7	Dichlorobenzene[1,4-]	2074	0	SW-846:8270C	2	10	75		µg/L	EPA MCL
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	2074	0	SW-846:8270C	2	10	1.5		µg/L	EPA TAP SCRN LVL
SVOA	120-83-2	Dichlorophenol[2,4-]	2074	0	SW-846:8270C	2	10	110		µg/L	EPA TAP SCRN LVL
SVOA	84-66-2	Diethylphthalate	2074	48	SW-846:8270C	2	10	29000		µg/L	EPA TAP SCRN LVL
SVOA	131-11-3	Dimethyl Phthalate	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	105-67-9	Dimethylphenol[2,4-]	2074	0	SW-846:8270C	2	10	730		µg/L	EPA TAP SCRN LVL
SVOA	84-74-2	Di-n-butylphthalate	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	2074	0	SW-846:8270C	3	10	2.9		µg/L	EPA TAP SCRN LVL
SVOA	51-28-5	Dinitrophenol[2,4-]	2074	0	SW-846:8270C	5	20	73		µg/L	EPA TAP SCRN LVL
SVOA	121-14-2	Dinitrotoluene[2,4-]	2074	14	SW-846:8270C	2	10	2.2		µg/L	EPA TAP SCRN LVL
SVOA	606-20-2	Dinitrotoluene[2,6-]	2073	2	SW-846:8270C	2	10	37		µg/L	EPA TAP SCRN LVL
SVOA	117-84-0	Di-n-octylphthalate	2074	5	SW-846:8270C	3	10			µg/L	
SVOA	88-85-7	Dinoseb	2074	0	SW-846:8270C	2	10	7		µg/L	EPA MCL
SVOA	123-91-1	Dioxane[1,4-]	2010	119	SW-846:8270C	2	10	6.7		µg/L	EPA TAP SCRN LVL
SVOA	122-39-4	Diphenylamine	2069	0	SW-846:8270C	3	10	910		µg/L	EPA TAP SCRN LVL
SVOA	206-44-0	Fluoranthene	2074	4	SW-846:8270C	0.2	1	1500		µg/L	EPA TAP SCRN LVL
SVOA	86-73-7	Fluorene	2074	3	SW-846:8270C	0.2	1	1500		µg/L	EPA TAP SCRN LVL
SVOA	118-74-1	Hexachlorobenzene	2074	0	SW-846:8270C	2	10	1		µg/L	EPA MCL
SVOA	87-68-3	Hexachlorobutadiene	2074	0	SW-846:8270C	2	10	8.6		µg/L	EPA TAP SCRN LVL
SVOA	77-47-4	Hexachlorocyclopentadiene	2074	0	SW-846:8270C	3	10	50		µg/L	EPA MCL
SVOA	67-72-1	Hexachloroethane	2074	0	SW-846:8270C	2	10	48		µg/L	EPA TAP SCRN LVL
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	2074	5	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	78-59-1	Isophorone	2074	0	SW-846:8270C	3	10	710		µg/L	EPA TAP SCRN LVL
SVOA	90-12-0	Methylnaphthalene[1-]	2072	3	SW-846:8270C	0.3	1	23		µg/L	EPA TAP SCRN LVL
SVOA	91-57-6	Methylnaphthalene[2-]	2074	2	SW-846:8270C	0.3	1	150		µg/L	EPA TAP SCRN LVL
SVOA	95-48-7	Methylphenol[2-]	2074	2	SW-846:8270C	2	10	1800		µg/L	EPA TAP SCRN LVL
SVOA	106-44-5	Methylphenol[4-]	1341	2	SW-846:8270C	3	10	180		µg/L	EPA TAP SCRN LVL
SVOA	91-20-3	Naphthalene	2074	3	SW-846:8270C	0.3	1	30		µg/L	NM GW STD
SVOA	88-74-4	Nitroaniline[2-]	2074	0	SW-846:8270C	2	10	370		µg/L	EPA TAP SCRN LVL
SVOA	99-09-2	Nitroaniline[3-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	100-01-6	Nitroaniline[4-]	2074	0	SW-846:8270C	3	10	34		µg/L	EPA TAP SCRN LVL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
SVOA	98-95-3	Nitrobenzene	2074	2	SW-846:8270C	3	10	1.2		µg/L	EPA TAP SCRN LVL
SVOA	88-75-5	Nitrophenol[2-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	100-02-7	Nitrophenol[4-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	55-18-5	Nitrosodiethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0014		µg/L	EPA TAP SCRN LVL
SVOA	62-75-9	Nitrosodimethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0042		µg/L	EPA TAP SCRN LVL
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	2074	0	SW-846:8270C	3	10	0.024		µg/L	EPA TAP SCRN LVL
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	2074	0	SW-846:8270C	2	10	0.096		µg/L	EPA TAP SCRN LVL
SVOA	930-55-2	Nitrosopyrrolidine[N-]	2074	0	SW-846:8270C	2	10	0.32		µg/L	EPA TAP SCRN LVL
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	2074	0	SW-846:8270C	2	10	3.2		µg/L	EPA TAP SCRN LVL
SVOA	608-93-5	Pentachlorobenzene	2074	0	SW-846:8270C	3	10	29		µg/L	EPA TAP SCRN LVL
SVOA	87-86-5	Pentachlorophenol	2074	1	SW-846:8270C	2	10	1		µg/L	EPA MCL
SVOA	85-01-8	Phenanthrene	2074	5	SW-846:8270C	0.2	1			µg/L	
SVOA	108-95-2	Phenol	2074	5	SW-846:8270C	1	10	5		µg/L	NM GW STD
SVOA	129-00-0	Pyrene	2074	2	SW-846:8270C	0.3	1	1100		µg/L	EPA TAP SCRN LVL
SVOA	110-86-1	Pyridine	1564	0	SW-846:8270C	3	10	37		µg/L	EPA TAP SCRN LVL
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	2074	0	SW-846:8270C	3	10	11		µg/L	EPA TAP SCRN LVL
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	2074	1	SW-846:8270C	2	10	1100		µg/L	EPA TAP SCRN LVL
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	2074	1	SW-846:8270C	2	10	70		µg/L	EPA MCL
SVOA	95-95-4	Trichlorophenol[2,4,5-]	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	88-06-2	Trichlorophenol[2,4,6-]	2074	0	SW-846:8270C	2	10	61		µg/L	EPA TAP SCRN LVL
VOA	67-64-1	Acetone	2543	253	SW-846:8260B	3.5	10	22000		µg/L	EPA TAP SCRN LVL
VOA	75-05-8	Acetonitrile	2543	5	SW-846:8260B	6.3	25	130		µg/L	EPA TAP SCRN LVL
VOA	107-02-8	Acrolein	2543	2	SW-846:8260B	1.3	5	0.042		µg/L	EPA TAP SCRN LVL
VOA	107-13-1	Acrylonitrile	2543	0	SW-846:8260B	1	5	0.45		µg/L	EPA TAP SCRN LVL
VOA	71-43-2	Benzene	2543	10	SW-846:8260B	0.3	1	5		µg/L	EPA MCL
VOA	108-86-1	Bromobenzene	2543	0	SW-846:8260B	0.25	1	88		µg/L	EPA TAP SCRN LVL
VOA	74-97-5	Bromochloromethane	2543	0	SW-846:8260B	0.3	1			µg/L	
VOA	75-27-4	Bromodichloromethane	2543	0	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	75-25-2	Bromoform	2543	1	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	74-83-9	Bromomethane	2543	2	SW-846:8260B	0.3	1	8.7		µg/L	EPA TAP SCRN LVL
VOA	71-36-3	Butanol[1-]	2004	6	SW-846:8260B	15	50	3700		µg/L	EPA TAP SCRN LVL
VOA	78-93-3	Butanone[2-]	2543	75	SW-846:8260B	1.3	5	7100		µg/L	EPA TAP SCRN LVL
VOA	104-51-8	Butylbenzene[n-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	135-98-8	Butylbenzene[sec-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	98-06-6	Butylbenzene[tert-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	75-15-0	Carbon Disulfide	2543	14	SW-846:8260B	1.3	5	1000		µg/L	EPA TAP SCRN LVL
VOA	56-23-5	Carbon Tetrachloride	2543	0	SW-846:8260B	0.3	1	5		µg/L	EPA MCL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
VOA	126-99-8	Chloro-1,3-butadiene[2-]	2543	0	SW-846:8260B	0.3	1	0.16		µg/L	EPA TAP SCRN LVL
VOA	107-05-1	Chloro-1-propene[3-]	2543	0	SW-846:8260B	1.5	5	6.5		µg/L	EPA TAP SCRN LVL
VOA	108-90-7	Chlorobenzene	2543	0	SW-846:8260B	0.25	1	100		µg/L	EPA MCL
VOA	124-48-1	Chlorodibromomethane	2543	1	SW-846:8260B	0.3	1	80		µg/L	EPA MCL
VOA	75-00-3	Chloroethane	2543	0	SW-846:8260B	0.3	1	21000		µg/L	EPA TAP SCRN LVL
VOA	67-66-3	Chloroform	2543	127	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	74-87-3	Chloromethane	2543	77	SW-846:8260B	0.3	1	190		µg/L	EPA TAP SCRN LVL
VOA	95-49-8	Chlorotoluene[2-]	2543	0	SW-846:8260B	0.25	1	730		µg/L	EPA TAP SCRN LVL
VOA	106-43-4	Chlorotoluene[4-]	2543	0	SW-846:8260B	0.25	1	2600		µg/L	EPA TAP SCRN LVL
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	2543	0	SW-846:8260B	0.3	1	0.2		µg/L	EPA MCL
VOA	106-93-4	Dibromoethane[1,2-]	2543	0	SW-846:8260B	0.25	1	0.05		µg/L	EPA MCL
VOA	74-95-3	Dibromomethane	2543	0	SW-846:8260B	0.3	1	8.2		µg/L	EPA TAP SCRN LVL
VOA	95-50-1	Dichlorobenzene[1,2-]	2543	1	SW-846:8260B	0.25	1	600		µg/L	EPA MCL
VOA	541-73-1	Dichlorobenzene[1,3-]	2543	16	SW-846:8260B	0.25	1			µg/L	
VOA	106-46-7	Dichlorobenzene[1,4-]	2543	0	SW-846:8260B	0.25	1	75		µg/L	EPA MCL
VOA	75-71-8	Dichlorodifluoromethane	2543	0	SW-846:8260B	0.3	1	390		µg/L	EPA TAP SCRN LVL
VOA	75-34-3	Dichloroethane[1,1-]	2543	66	SW-846:8260B	0.3	1	25		µg/L	NM GW STD
VOA	107-06-2	Dichloroethane[1,2-]	2543	6	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	75-35-4	Dichloroethene[1,1-]	2543	65	SW-846:8260B	0.3	1	5		µg/L	NM GW STD
VOA	156-59-2	Dichloroethene[cis-1,2-]	2543	8	SW-846:8260B	0.3	1	70		µg/L	EPA MCL
VOA	156-60-5	Dichloroethene[trans-1,2-]	2543	0	SW-846:8260B	0.3	1	100		µg/L	EPA MCL
VOA	78-87-5	Dichloropropane[1,2-]	2543	0	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	142-28-9	Dichloropropane[1,3-]	2543	0	SW-846:8260B	0.3	1	730		µg/L	EPA TAP SCRN LVL
VOA	594-20-7	Dichloropropane[2,2-]	2543	0	SW-846:8260B	0.3	1			µg/L	
VOA	563-58-6	Dichloropropene[1,1-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	10061-01-5	Dichloropropene[cis-1,3-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	10061-02-6	Dichloropropene[trans-1,3-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	60-29-7	Diethyl Ether	2004	5	SW-846:8260B	0.3	1	7300		µg/L	EPA TAP SCRN LVL
VOA	97-63-2	Ethyl Methacrylate	2543	0	SW-846:8260B	1	5	3300		µg/L	EPA TAP SCRN LVL
VOA	100-41-4	Ethylbenzene	2543	4	SW-846:8260B	0.25	1	700		µg/L	EPA MCL
VOA	87-68-3	Hexachlorobutadiene	2543	0	SW-846:8260B	0.3	1	8.6		µg/L	EPA TAP SCRN LVL
VOA	591-78-6	Hexanone[2-]	2543	1	SW-846:8260B	1.3	5	47		µg/L	EPA TAP SCRN LVL
VOA	74-88-4	Iodomethane	2543	1	SW-846:8260B	1.3	5			µg/L	
VOA	78-83-1	Isobutyl alcohol	2543	1	SW-846:8260B	13	50	11000		µg/L	EPA TAP SCRN LVL
VOA	98-82-8	Isopropylbenzene	2543	11	SW-846:8260B	0.25	1	680		µg/L	EPA TAP SCRN LVL
VOA	99-87-6	Isopropyltoluene[4-]	2543	4	SW-846:8260B	0.25	1			µg/L	
VOA	126-98-7	Methacrylonitrile	2542	0	SW-846:8260B	1	5	1		µg/L	EPA TAP SCRN LVL

Table C-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
VOA	80-62-6	Methyl Methacrylate	2543	1	SW-846:8260B	1	5	1400		µg/L	EPA TAP SCRN LVL
VOA	1634-04-4	Methyl tert-Butyl Ether	2004	32	SW-846:8260B	0.25	1	120		µg/L	EPA TAP SCRN LVL
VOA	108-10-1	Methyl-2-pentanone[4-]	2543	8	SW-846:8260B	1.3	5	2000		µg/L	EPA TAP SCRN LVL
VOA	75-09-2	Methylene Chloride	2543	15	SW-846:8260B	3	10	5		µg/L	EPA MCL
VOA	91-20-3	Naphthalene	2543	7	SW-846:8260B	0.25	1	30		µg/L	NM GW STD
VOA	107-12-0	Propionitrile	2543	0	SW-846:8260B	1.5	5			µg/L	
VOA	103-65-1	Propylbenzene[1-]	2543	0	SW-846:8260B	0.25	1	1300		µg/L	EPA TAP SCRN LVL
VOA	100-42-5	Styrene	2543	5	SW-846:8260B	0.25	1	100		µg/L	EPA MCL
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	2543	0	SW-846:8260B	0.3	1	5.2		µg/L	EPA TAP SCRN LVL
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	2543	0	SW-846:8260B	0.25	1	10		µg/L	NM GW STD
VOA	127-18-4	Tetrachloroethene	2543	86	SW-846:8260B	0.3	1	5		µg/L	EPA MCL
VOA	108-88-3	Toluene	2543	245	SW-846:8260B	0.25	1	750		µg/L	NM GW STD
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2541	1	SW-846:8260B	1	5	59000		µg/L	EPA TAP SCRN LVL
VOA	87-61-6	Trichlorobenzene[1,2,3-]	2543	2	SW-846:8260B	0.33	1	29		µg/L	EPA TAP SCRN LVL
VOA	120-82-1	Trichlorobenzene[1,2,4-]	2543	1	SW-846:8260B	0.3	1	70		µg/L	EPA MCL
VOA	71-55-6	Trichloroethane[1,1,1-]	2543	54	SW-846:8260B	0.33	1	60		µg/L	NM GW STD
VOA	79-00-5	Trichloroethane[1,1,2-]	2543	9	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	79-01-6	Trichloroethene	2543	150	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	75-69-4	Trichlorofluoromethane	2543	0	SW-846:8260B	0.3	1	1300		µg/L	EPA TAP SCRN LVL
VOA	96-18-4	Trichloropropane[1,2,3-]	2543	0	SW-846:8260B	0.3	1	0.0072		µg/L	EPA TAP SCRN LVL
VOA	95-63-6	Trimethylbenzene[1,2,4-]	2543	3	SW-846:8260B	0.25	1	15		µg/L	EPA TAP SCRN LVL
VOA	108-67-8	Trimethylbenzene[1,3,5-]	2543	0	SW-846:8260B	0.25	1	370		µg/L	EPA TAP SCRN LVL
VOA	108-05-4	Vinyl acetate	2543	0	SW-846:8260B	1.5	5	410		µg/L	EPA TAP SCRN LVL
VOA	75-01-4	Vinyl Chloride	2543	0	SW-846:8260B	0.5	1	1		µg/L	NM GW STD
VOA	95-47-6	Xylene[1,2-]	2543	4	SW-846:8260B	0.3	1	1200		µg/L	EPA TAP SCRN LVL
VOA	Xylene[1,3 and 1,4]	Xylene[1,3-]+Xylene[1,4-]	2541	20	SW-846:8260B	0.5	2			µg/L	

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels.

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory's 2007 groundwater background report (LANL 2007, 095817).

Table C-4.1-2
Analytes, Analytical Methods, and MDLs and PQLs Obtained for 2010 Analyses of Base-Flow Samples by Contract Laboratories and Number of Sample Analyses and Detections for the Period 2006 to 2010

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	75	27	SW-846:8290		0.00005		µg/L	
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	75	45	SW-846:8290		0.00005		µg/L	
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	75	16	SW-846:8290		0.00005		µg/L	
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	75	28	SW-846:8290		0.00005		µg/L	
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	75	5	SW-846:8290		0.00005		µg/L	
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	75	14	SW-846:8290		0.00005		µg/L	
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	75	5	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	75	1	SW-846:8290		0.00005		µg/L	
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	75	22	SW-846:8290		0.00005		µg/L	
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	75	37	SW-846:8290		0.0001		µg/L	
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	75	21	SW-846:8290		0.0001		µg/L	
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	75	2	SW-846:8290		0.00005		µg/L	
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	75	10	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	75	17	SW-846:8290		0.00005		µg/L	
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	75	3	SW-846:8290		0.00001	5.1E-08	µg/L	NM HH OO
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	75	10	SW-846:8290		0.00001		µg/L	
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	75	6	SW-846:8290		0.00001		µg/L	
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	75	11	SW-846:8290		0.00001		µg/L	
DRO	TPH-DRO	Total Petroleum Hydrocarbons Diesel Range Organics	1	1	SW-846:8015M	65	200		µg/L	
Geninorg	ALK-CO3	Alkalinity-CO3	399	81	EPA:310.1	0.73	1		mg/L	
Geninorg	ALK-CO3+HCO3	Alkalinity-CO3+HCO3	399	396	EPA:310.1	0.73	1		mg/L	
Geninorg	NH3-N	Ammonia as Nitrogen	404	197	EPA:350.1	0.016	0.05		mg/L	
Geninorg	Br(-1)	Bromide	399	135	EPA:300.0	0.066	0.2		mg/L	
Geninorg	Ca	Calcium	724	724	SW-846:6010B	0.05	0.2		mg/L	
Geninorg	Cl(-1)	Chloride	395	395	EPA:300.0	0.066	0.2		mg/L	
Geninorg	CN(TOTAL)	Cyanide (Total)	338	71	EPA:335.4	0.0017	0.005		mg/L	
Geninorg	F(-1)	Fluoride	402	380	EPA:300.0	0.033	0.1		mg/L	
Geninorg	HARDNESS	Hardness	721	721	SM:A2340B	0.35	1.24		mg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Geninorg	Mg	Magnesium	724	724	SW-846:6010B	0.085	0.3		mg/L	
Geninorg	NO3+NO2-N	Nitrate-Nitrite as Nitrogen	404	247	EPA:353.2	0.01	0.05	132	mg/L	NM LVSTK WTR STD
Geninorg	ClO4	Perchlorate	460	305	SW-846:6850	0.05	0.2		µg/L	
Geninorg	pH	pH	395	395	EPA:150.1	0.01	0.1		SU	
Geninorg	K	Potassium	724	724	SW-846:6010B	0.05	0.15		mg/L	
Geninorg	Na	Sodium	724	724	SW-846:6010B	0.1	0.3		mg/L	
Geninorg	SO4(-2)	Sulfate	402	400	EPA:300.0	0.1	0.4		mg/L	
Geninorg	SSC	Suspended Sediment Concentration	339	262	EPA:160.2	0.76	3.33		mg/L	
Geninorg	TDS	Total Dissolved Solids	392	390	EPA:160.1	2.4	10		mg/L	
Geninorg	TKN	Total Kjeldahl Nitrogen	487	380	EPA:351.2	0.033	0.1		mg/L	
Geninorg	TOC	Total Organic Carbon	353	352	SW-846:9060	0.33	1		mg/L	
Geninorg	PO4-P	Total Phosphate as Phosphorus	398	233	EPA:365.4	0.015	0.05		mg/L	
Geninorg	TSS	Total Suspended Solids	19	15	EPA:160.2	2.3	10		mg/L	
Herb	94-75-7	D[2,4-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	75-99-0	Dalapon	42	0	SW-846:8151A	1.3	5.3		µg/L	
Herb	94-82-6	DB[2,4-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	1918-00-9	Dicamba	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	120-36-5	Dichlorprop	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	88-85-7	Dinoseb	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	94-74-6	MCPA	42	0	SW-846:8151A	12	53		µg/L	
Herb	93-65-2	MCPP	42	0	SW-846:8151A	11	53		µg/L	
Herb	93-76-5	T[2,4,5-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	93-72-1	TP[2,4,5-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Hexp	6629-29-4	2,4-Diamino-6-nitrotoluene	175	4	SW-846:8321	0.39	1.3		µg/L	
Hexp	59229-75-3	2,6-Diamino-4-nitrotoluene	175	2	SW-846:8321	0.39	1.3		µg/L	
Hexp	618-87-1	3,5-Dinitroaniline	175	1	SW-846:8321	0.39	1.3		µg/L	
Hexp	19406-51-0	Amino-2,6-dinitrotoluene[4-]	175	12	SW-846:8321	0.1	0.33		µg/L	
Hexp	35572-78-2	Amino-4,6-dinitrotoluene[2-]	175	14	SW-846:8321	0.1	0.33		µg/L	
Hexp	99-65-0	Dinitrobenzene[1,3-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	121-14-2	Dinitrotoluene[2,4-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	606-20-2	Dinitrotoluene[2,6-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	DNX	DNX	131	8	SW-846:8330	0.069	0.5		µg/L	
Hexp	2691-41-0	HMX	175	46	SW-846:8321	0.1	0.33		µg/L	
Hexp	MNX	MNX	131	9	SW-846:8330	0.091	0.5		µg/L	
Hexp	98-95-3	Nitrobenzene	175	0	SW-846:8321	0.1	0.33	690	µg/L	NM HH OO
Hexp	88-72-2	Nitrotoluene[2-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	99-08-1	Nitrotoluene[3-]	175	0	SW-846:8321	0.1	0.33		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Hexp	99-99-0	Nitrotoluene[4-]	175	0	SW-846:8321	0.1	0.65		µg/L	
Hexp	78-11-5	PETN	175	0	SW-846:8321	0.13	1.3		µg/L	
Hexp	121-82-4	RDX	175	30	SW-846:8321	0.1	0.33		µg/L	
Hexp	3058-38-6	TATB	175	0	SW-846:8321	0.39	1.3		µg/L	
Hexp	479-45-8	Tetryl	175	0	SW-846:8321	0.13	0.65		µg/L	
Hexp	TNX	TNX	131	7	SW-846:8330	0.082	0.5		µg/L	
Hexp	99-35-4	Trinitrobenzene[1,3,5-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	118-96-7	Trinitrotoluene[2,4,6-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	78-30-8	Tris (o-cresyl) phosphate	175	0	SW-846:8321	0.39	1.3		µg/L	
Metals	Al	Aluminum	724	519	SW-846:6010B	68	200	391	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Sb	Antimony	724	36	SW-846:6020	0.5	3	640	µg/L	NM HH OO
Metals	As	Arsenic	730	205	SW-846:6020	1.5	5	9	µg/L	NM HH OO
Metals	Ba	Barium	724	724	SW-846:6010B	1	5		µg/L	
Metals	Be	Beryllium	724	20	SW-846:6010B	1	5		µg/L	
Metals	B	Boron	716	540	SW-846:6010B	15	50	5000	µg/L	NM LVSTK WTR STD
Metals	Cd	Cadmium	724	70	SW-846:6020	0.11	1	0.23	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Cr	Chromium	728	419	SW-846:6020	2.5	10	35	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Co	Cobalt	724	117	SW-846:6010B	1	5	1000	µg/L	NM LVSTK WTR STD
Metals	Cu	Copper	724	264	SW-846:6010B	3	10	4	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Fe	Iron	724	627	SW-846:6010B	30	100		µg/L	
Metals	Pb	Lead	724	286	SW-846:6020	0.5	2	1	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Mn	Manganese	724	660	SW-846:6010B	2	10	1216	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Hg	Mercury	719	17	EPA:245.2	0.066	0.2	0.77	µg/L	NM WQCC WLDLF HAB
Metals	Mo	Molybdenum	724	495	SW-846:6020	0.1	0.5		µg/L	
Metals	Ni	Nickel	724	643	SW-846:6020	0.5	2	24	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Se	Selenium	724	45	SW-846:6020	1	5	5	µg/L	NM WQCC WLDLF HAB
Metals	SiO2	Silicon Dioxide	225	225	SW-846:6010B	0.053	0.213		mg/L	
Metals	Ag	Silver	724	78	SW-846:6020	0.2	1	0.7	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Sr	Strontium	716	716	SW-846:6010B	1	5		µg/L	
Metals	Tl	Thallium	724	69	SW-846:6020	0.3	1	0.47	µg/L	NM HH OO
Metals	Sn	Tin	716	10	SW-846:6010B	2.5	10		µg/L	
Metals	U	Uranium	716	524	SW-846:6020	0.05	0.2		µg/L	
Metals	V	Vanadium	724	603	SW-846:6010B	1	5	100	µg/L	NM LVSTK WTR STD
Metals	Zn	Zinc	724	490	SW-846:6010B	3.3	10	53	µg/L	NM Aqu Chronic 30 mg/L hardness
PCB	12674-11-2	Aroclor-1016	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11104-28-2	Aroclor-1221	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11141-16-5	Aroclor-1232	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB	53469-21-9	Aroclor-1242	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	12672-29-6	Aroclor-1248	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11097-69-1	Aroclor-1254	216	6	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11096-82-5	Aroclor-1260	216	7	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	37324-23-5	Aroclor-1262	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB Cong	2051-60-7	PCB-1	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	33146-45-1	PCB-10	10	0	EPA:1668A		0.000035		µg/L	
PCB Cong	39485-83-1	PCB-100	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-21-3	PCB-103	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	56558-16-8	PCB-104	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32598-14-4	PCB-105	53	7	EPA:1668A		0.000035		µg/L	
PCB Cong	70424-69-0	PCB-106	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-106/118	PCB-106/PCB-118	18	3	EPA:1668A		0.0000097		µg/L	
PCB Cong	70424-68-9	PCB-107	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-107/109	PCB-107/PCB-109	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-108/112	PCB-108/PCB-112	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-108/124	PCB-108/PCB-124	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	2050-67-1	PCB-11	53	4	EPA:1668A		0.000056		µg/L	
PCB Cong	38380-03-9	PCB-110	43	5	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-32-0	PCB-111	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-111/115	PCB-111/PCB-115	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-36-9	PCB-112	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-10-5	PCB-113	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-37-0	PCB-114	53	1	EPA:1668A		0.000007		µg/L	
PCB Cong	56558-17-9	PCB-119	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-12/13	PCB-12/PCB-13	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	68194-12-7	PCB-120	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	56558-18-0	PCB-121	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	76842-07-4	PCB-122	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	65510-44-3	PCB-123	53	1	EPA:1668A		0.000035		µg/L	
PCB Cong	70424-70-3	PCB-124	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	57465-28-8	PCB-126	53	1	EPA:1668A		0.000007		µg/L	
PCB Cong	39635-33-1	PCB-127	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-128/162	PCB-128/PCB-162	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55215-18-4	PCB-129	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-66-8	PCB-130	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	61798-70-7	PCB-131	53	1	EPA:1668A		0.000028		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	PCB-132/161	PCB-132/PCB-161	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-04-3	PCB-133	35	2	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-133/142	PCB-133/PCB-142	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52704-70-8	PCB-134	35	2	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-134/143	PCB-134/PCB-143	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52744-13-5	PCB-135	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	38411-22-2	PCB-136	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-06-5	PCB-137	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-139/140	PCB-139/PCB-140	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	PCB-139/149	PCB-139/PCB-149	18	1	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-41-5	PCB-14	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	59291-64-4	PCB-140	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52712-04-6	PCB-141	53	8	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-61-4	PCB-142	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-15-0	PCB-143	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-14-9	PCB-144	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-40-5	PCB-145	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-146/165	PCB-146/PCB-165	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-13-8	PCB-147	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-41-6	PCB-148	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	2050-68-2	PCB-15	53	3	EPA:1668A		0.000056		µg/L	
PCB Cong	68194-08-1	PCB-150	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-63-5	PCB-151	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-09-2	PCB-152	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-22-4	PCB-154	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	33979-03-2	PCB-155	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38380-08-4	PCB-156	43	5	EPA:1668A		0.000004		µg/L	
PCB Cong	PCB-156/157	PCB-156/PCB-157	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	69782-90-7	PCB-157	43	1	EPA:1668A		0.000005		µg/L	
PCB Cong	PCB-158/160	PCB-158/PCB-160	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-35-3	PCB-159	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-78-9	PCB-16	10	0	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-16/32	PCB-16/PCB-32	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-62-5	PCB-160	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	74472-43-8	PCB-161	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	39635-34-2	PCB-162	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	74472-46-1	PCB-165	10	0	EPA:1668A		0.000007		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	41411-63-6	PCB-166	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-72-6	PCB-167	53	6	EPA:1668A		0.000007		µg/L	
PCB Cong	59291-65-5	PCB-168	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32774-16-6	PCB-169	53	0	EPA:1668A		0.000007		µg/L	
PCB Cong	37680-66-3	PCB-17	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	35065-30-6	PCB-170	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-71-5	PCB-171	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-171/173	PCB-171/PCB-173	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	52663-74-8	PCB-172	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-16-1	PCB-173	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38411-25-5	PCB-174	53	8	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-70-7	PCB-175	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-65-7	PCB-176	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-70-4	PCB-177	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-67-9	PCB-178	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-64-6	PCB-179	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	37680-65-2	PCB-18	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-18/30	PCB-18/PCB-30	10	3	EPA:1668A		0.0000138		µg/L	
PCB Cong	PCB-180/193	PCB-180/PCB-193	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	74472-47-2	PCB-181	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-23-5	PCB-182	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-182/187	PCB-182/PCB-187	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-69-1	PCB-183	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-183/185	PCB-183/PCB-185	10	3	EPA:1668A		0.0000139		µg/L	
PCB Cong	74472-48-3	PCB-184	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52712-05-7	PCB-185	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-49-4	PCB-186	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74487-85-7	PCB-188	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-31-9	PCB-189	53	3	EPA:1668A		0.000007		µg/L	
PCB Cong	38444-73-4	PCB-19	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-64-7	PCB-190	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-50-7	PCB-191	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-51-8	PCB-192	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	69782-91-8	PCB-193	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-08-7	PCB-194	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-78-2	PCB-195	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-196/203	PCB-196/PCB-203	18	0	EPA:1668A		0.000028		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	33091-17-7	PCB-197	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-197/200	PCB-197/PCB-200	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	68194-17-2	PCB-198	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-75-9	PCB-199	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-61-8	PCB-2	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-20/21/33	PCB-20/PCB-21/PCB-33	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-73-7	PCB-200	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-71-8	PCB-201	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	2136-99-4	PCB-202	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-52-9	PCB-204	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-53-0	PCB-205	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-72-9	PCB-206	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-79-3	PCB-207	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-77-1	PCB-208	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-24-3	PCB-209	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-21/33	PCB-21/PCB-33	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	38444-85-8	PCB-22	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	55720-44-0	PCB-23	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55702-45-9	PCB-24	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-24/27	PCB-24/PCB-27	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55712-37-3	PCB-25	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-81-4	PCB-26	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-26/29	PCB-26/PCB-29	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	38444-76-7	PCB-27	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	7012-37-5	PCB-28	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	15862-07-4	PCB-29	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-62-9	PCB-3	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	35693-92-6	PCB-30	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	16606-02-3	PCB-31	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-77-8	PCB-32	10	1	EPA:1668A		0.000007		µg/L	
PCB Cong	37680-68-5	PCB-34	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	37680-69-6	PCB-35	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-87-0	PCB-36	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-90-5	PCB-37	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	53555-66-1	PCB-38	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-88-1	PCB-39	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	13029-08-8	PCB-4	35	0	EPA:1668A		0.000035		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	PCB-4/10	PCB-4/PCB-10	18	0	EPA:1668A		0.000056		µg/L	
PCB Cong	38444-93-8	PCB-40	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-40/71	PCB-40/PCB-71	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	52663-59-9	PCB-41	35	1	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-41/64/71/72	PCB-41/PCB-64/PCB-71/PCB-72	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	36559-22-5	PCB-42	35	1	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-42/59	PCB-42/PCB-59	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-46-8	PCB-43	35	1	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-43/49	PCB-43/PCB-49	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-39-5	PCB-44	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-44/47/65	PCB-44/PCB-47/PCB-65	10	1	EPA:1668A		0.00002		µg/L	
PCB Cong	70362-45-7	PCB-45	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-45/51	PCB-45/PCB-51	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	41464-47-5	PCB-46	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-47-9	PCB-48	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-48/75	PCB-48/PCB-75	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-49/69	PCB-49/PCB-69	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	16605-91-7	PCB-5	53	2	EPA:1668A		0.000056		µg/L	
PCB Cong	62796-65-0	PCB-50	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-50/53	PCB-50/PCB-53	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	68194-04-7	PCB-51	43	13	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-52/69	PCB-52/PCB-69	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-41-9	PCB-53	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	15968-05-5	PCB-54	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74338-24-2	PCB-55	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-43-1	PCB-56	35	5	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-56/60	PCB-56/PCB-60	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70424-67-8	PCB-57	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-49-7	PCB-58	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-59/62/75	PCB-59/PCB-62/PCB-75	10	0	EPA:1668A		0.00002		µg/L	
PCB Cong	25569-80-6	PCB-6	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	33025-41-1	PCB-60	10	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-61/70	PCB-61/PCB-70	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	54230-22-7	PCB-62	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-34-7	PCB-63	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-58-8	PCB-64	10	4	EPA:1668A		0.000007		µg/L	
PCB Cong	33284-54-7	PCB-65	43	0	EPA:1668A		0.000028		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	32598-10-0	PCB-66	10	3	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-66/PCB-76	PCB-66/PCB-76	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-53-8	PCB-67	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-52-7	PCB-68	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	33284-50-3	PCB-7	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-7/9	PCB-7/PCB-9	18	0	EPA:1668A		0.000056		µg/L	
PCB Cong	41464-42-0	PCB-72	10	1	EPA:1668A		0.000007		µg/L	
PCB Cong	74338-23-1	PCB-73	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32690-93-0	PCB-74	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32598-13-3	PCB-77	53	5	EPA:1668A		0.000007		µg/L	
PCB Cong	70362-49-1	PCB-78	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-48-6	PCB-79	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-43-7	PCB-8	10	2	EPA:1668A		0.0000114		µg/L	
PCB Cong	33284-52-5	PCB-80	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-50-4	PCB-81	53	0	EPA:1668A		0.000007		µg/L	
PCB Cong	52663-62-4	PCB-82	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-20-2	PCB-83	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-84/PCB-92	PCB-84/PCB-92	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-85/116	PCB-85/PCB-116	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-85/116/117	PCB-85/PCB-116/PCB-117	10	1	EPA:1668A		0.00002		µg/L	
PCB Cong	55312-69-1	PCB-86	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-87/117/125	PCB-87/PCB-117/PCB-125	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55215-17-3	PCB-88/91	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-57-2	PCB-89	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-39-1	PCB-9	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-90/101	PCB-90/PCB-101	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-56-1	PCB-93	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-93/100	PCB-93/PCB-100	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	73575-55-0	PCB-94	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-95/98/102	PCB-95/PCB-98/PCB-102	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-54-9	PCB-96	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-51-1	PCB-97	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-98/102	PCB-98/PCB-102	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	38380-01-7	PCB-99	53	6	EPA:1668A		0.000035		µg/L	
PCB Cong	DECACB(Total)	Total decaCB	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	25512-42-9	Total diCB	53	8	EPA:1668A		0.000056		µg/L	
PCB Cong	27323-18-8	Total monoCB	53	0	EPA:1668A		0.000028		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	53742-07-7	Total nonaCB	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	55722-26-4	Total octaCB	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	25429-29-2	Total pentaCB	53	13	EPA:1668A		0.00003		µg/L	
PCB Cong	25323-68-6	Total triCB	53	7	EPA:1668A		0.000028		µg/L	
Pest	309-00-2	Aldrin	197	1	SW-846:8081A	0.005	0.02	0.0005	µg/L	NM HH OO
Pest	319-84-6	BHC[alpha-]	197	1	SW-846:8081A	0.005	0.02		µg/L	
Pest	319-85-7	BHC[beta-]	197	1	SW-846:8081A	0.006	0.02		µg/L	
Pest	319-86-8	BHC[delta-]	197	4	SW-846:8081A	0.005	0.02		µg/L	
Pest	58-89-9	BHC[gamma-]	197	1	SW-846:8081A	0.005	0.02	0.95	µg/L	NM Aqu Acute
Pest	5103-71-9	Chlordane[alpha-]	197	1	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic
Pest	5103-74-2	Chlordane[gamma-]	197	2	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic
Pest	72-54-8	DDD[4,4'-]	197	3	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	72-55-9	DDE[4,4'-]	197	5	SW-846:8081A	0.005	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	50-29-3	DDT[4,4'-]	197	4	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	60-57-1	Dieldrin	197	2	SW-846:8081A	0.01	0.04	0.00054	µg/L	NM HH OO
Pest	959-98-8	Endosulfan I	197	2	SW-846:8081A	0.005	0.02	0.056	µg/L	NM Aqu Chronic
Pest	33213-65-9	Endosulfan II	197	2	SW-846:8081A	0.011	0.045	0.056	µg/L	NM Aqu Chronic
Pest	1031-07-8	Endosulfan Sulfate	197	2	SW-846:8081A	0.01	0.04	89	µg/L	NM HH OO
Pest	72-20-8	Endrin	197	2	SW-846:8081A	0.01	0.04	0.036	µg/L	NM Aqu Chronic
Pest	7421-93-4	Endrin Aldehyde	197	3	SW-846:8081A	0.005	0.04	0.3	µg/L	NM HH OO
Pest	53494-70-5	Endrin Ketone	197	1	SW-846:8081A	0.01	0.04		µg/L	
Pest	76-44-8	Heptachlor	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic
Pest	1024-57-3	Heptachlor Epoxide	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic
Pest	72-43-5	Methoxychlor[4,4'-]	197	1	SW-846:8081A	0.05	0.2		µg/L	
Pest	8001-35-2	Toxaphene (Technical Grade)	197	0	SW-846:8081A	0.15	0.5	0.0002	µg/L	NM Aqu Chronic
Rad	Am-241	Americium-241	434	25	Alpha Spectroscopy	0.05		400	pCi/L	DOE BCG WATER
Rad	Cs-137	Cesium-137	427	9	Gamma Spectroscopy	8		40	pCi/L	DOE BCG WATER
Rad	Co-60	Cobalt-60	427	0	Gamma Spectroscopy	8		4000	pCi/L	DOE BCG WATER
Rad	GROSSA	Gross alpha	292	71	Gas Proportional Counting	3		15	pCi/L	NM LVSTK WTR STD
Rad	GROSSB	Gross beta	292	237	Gas Proportional Counting	3			pCi/L	
Rad	GROSSG	Gross gamma	427	1	Gamma Spectroscopy	120			pCi/L	
Rad	Np-237	Neptunium-237	437	0	Alpha Spectroscopy	0.05			pCi/L	
Rad	Pu-238	Plutonium-238	433	30	Alpha Spectroscopy	0.05			pCi/L	
Rad	Pu-239/240	Plutonium-239/240	433	44	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
Rad	K-40	Potassium-40	427	5	Gamma Spectroscopy	10			pCi/L	
Rad	Ra-226	Radium-226	73	11	Alpha Spectroscopy	1		30	pCi/L	NM LVSTK WTR STD
Rad	Ra-226	Radium-226	73	11	Gas Proportional Counting	1		30	pCi/L	NM LVSTK WTR STD

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Rad	Ra-228	Radium-228	69	15	Gas Proportional Counting	1		30	pCi/L	NM LVSTK WTR STD
Rad	Na-22	Sodium-22	427	0	Gamma Spectroscopy	10			pCi/L	
Rad	Sr-90	Strontium-90	427	59	Gas Proportional Counting	0.5		300	pCi/L	DOE BCG WATER
Rad	Th-228	Thorium-228	69	21	Alpha Spectroscopy	0.05			pCi/L	
Rad	Th-230	Thorium-230	69	16	Alpha Spectroscopy	0.05			pCi/L	
Rad	Th-232	Thorium-232	69	23	Alpha Spectroscopy	0.05		300	pCi/L	DOE BCG WATER
Rad	H-3	Tritium	195	190	Liquid Scintillation Counting	250		20000	pCi/L	NM LVSTK WTR STD
Rad	U-234	Uranium-234	431	295	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
Rad	U-235/236	Uranium-235/236	431	39	Alpha Spectroscopy	0.05			pCi/L	
Rad	U-238	Uranium-238	431	309	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
SVOA	83-32-9	Acenaphthene	281	1	SW-846:8270C	0.33	1.1	990	µg/L	NM HH OO
SVOA	208-96-8	Acenaphthylene	281	1	SW-846:8270C	0.21	1.1		µg/L	
SVOA	62-53-3	Aniline	281	0	SW-846:8270C	2.5	10		µg/L	
SVOA	120-12-7	Anthracene	281	2	SW-846:8270C	0.21	1.1	40000	µg/L	NM HH OO
SVOA	1912-24-9	Atrazine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	103-33-3	Azobenzene	281	0	SW-846:8270C	2	10		µg/L	
SVOA	92-87-5	Benzidine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	56-55-3	Benzo(a)anthracene	281	2	SW-846:8270C	0.2	1		µg/L	
SVOA	50-32-8	Benzo(a)pyrene	281	3	SW-846:8270C	0.2	1	0.18	µg/L	NM HH OO
SVOA	205-99-2	Benzo(b)fluoranthene	281	1	SW-846:8270C	0.2	1		µg/L	
SVOA	191-24-2	Benzo(g,h,i)perylene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	207-08-9	Benzo(k)fluoranthene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	65-85-0	Benzoic Acid	281	3	SW-846:8270C	6	20		µg/L	
SVOA	100-51-6	Benzyl Alcohol	281	1	SW-846:8270C	2	10		µg/L	
SVOA	111-91-1	Bis(2-chloroethoxy)methane	281	1	SW-846:8270C	3	10		µg/L	
SVOA	111-44-4	Bis(2-chloroethyl)ether	281	1	SW-846:8270C	2	10		µg/L	
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	281	13	SW-846:8270C	2	10		µg/L	
SVOA	101-55-3	Bromophenyl-phenylether[4-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	85-68-7	Butylbenzylphthalate	281	0	SW-846:8270C	2	10	1900	µg/L	NM HH OO
SVOA	59-50-7	Chloro-3-methylphenol[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	106-47-8	Chloroaniline[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	91-58-7	Chloronaphthalene[2-]	281	1	SW-846:8270C	0.3	1	1600	µg/L	NM HH OO
SVOA	95-57-8	Chlorophenol[2-]	281	0	SW-846:8270C	2	10	150	µg/L	NM HH OO
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	281	0	SW-846:8270C	2	10		µg/L	
SVOA	218-01-9	Chrysene	281	2	SW-846:8270C	0.2	1		µg/L	
SVOA	53-70-3	Dibenz(a,h)anthracene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	132-64-9	Dibenzofuran	281	0	SW-846:8270C	2	10		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
SVOA	95-50-1	Dichlorobenzene[1,2-]	281	0	SW-846:8270C	2	10	1300	µg/L	NM HH OO
SVOA	541-73-1	Dichlorobenzene[1,3-]	281	0	SW-846:8270C	2	10	960	µg/L	NM HH OO
SVOA	106-46-7	Dichlorobenzene[1,4-]	281	1	SW-846:8270C	2	10	190	µg/L	NM HH OO
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	120-83-2	Dichlorophenol[2,4-]	281	0	SW-846:8270C	2	10	290	µg/L	NM HH OO
SVOA	84-66-2	Diethylphthalate	281	3	SW-846:8270C	2	10	44000	µg/L	NM HH OO
SVOA	131-11-3	Dimethyl Phthalate	281	0	SW-846:8270C	2	10	1100000	µg/L	NM HH OO
SVOA	105-67-9	Dimethylphenol[2,4-]	281	0	SW-846:8270C	2	10	850	µg/L	NM HH OO
SVOA	84-74-2	Di-n-butylphthalate	281	0	SW-846:8270C	2	10	4500	µg/L	NM HH OO
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	281	0	SW-846:8270C	3	10	280	µg/L	NM HH OO
SVOA	51-28-5	Dinitrophenol[2,4-]	281	0	SW-846:8270C	5	20	5300	µg/L	NM HH OO
SVOA	121-14-2	Dinitrotoluene[2,4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	606-20-2	Dinitrotoluene[2,6-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	117-84-0	Di-n-octylphthalate	281	0	SW-846:8270C	3	10		µg/L	
SVOA	88-85-7	Dinoseb	281	0	SW-846:8270C	2	10		µg/L	
SVOA	123-91-1	Dioxane[1,4-]	270	6	SW-846:8270C	2	10		µg/L	
SVOA	122-39-4	Diphenylamine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	206-44-0	Fluoranthene	281	2	SW-846:8270C	0.2	1	140	µg/L	NM HH OO
SVOA	86-73-7	Fluorene	281	2	SW-846:8270C	0.2	1	5300	µg/L	NM HH OO
SVOA	118-74-1	Hexachlorobenzene	281	0	SW-846:8270C	2	10	0.0029	µg/L	NM HH OO
SVOA	87-68-3	Hexachlorobutadiene	281	0	SW-846:8270C	2	10		µg/L	
SVOA	77-47-4	Hexachlorocyclopentadiene	281	0	SW-846:8270C	3	10	1100	µg/L	NM HH OO
SVOA	67-72-1	Hexachloroethane	281	0	SW-846:8270C	2	10		µg/L	
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	281	4	SW-846:8270C	0.2	1		µg/L	
SVOA	78-59-1	Isophorone	281	0	SW-846:8270C	3	10		µg/L	
SVOA	90-12-0	Methylnaphthalene[1-]	281	1	SW-846:8270C	0.3	1		µg/L	
SVOA	91-57-6	Methylnaphthalene[2-]	281	2	SW-846:8270C	0.3	1		µg/L	
SVOA	95-48-7	Methylphenol[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	106-44-5	Methylphenol[4-]	161	0	SW-846:8270C	3	10		µg/L	
SVOA	91-20-3	Naphthalene	281	1	SW-846:8270C	0.3	1		µg/L	
SVOA	88-74-4	Nitroaniline[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	99-09-2	Nitroaniline[3-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	100-01-6	Nitroaniline[4-]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	98-95-3	Nitrobenzene	281	0	SW-846:8270C	3	10	690	µg/L	NM HH OO
SVOA	88-75-5	Nitrophenol[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	100-02-7	Nitrophenol[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	55-18-5	Nitrosodiethylamine[N-]	281	1	SW-846:8270C	2	10		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
SVOA	62-75-9	Nitrosodimethylamine[N-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	930-55-2	Nitrosopyrrolidine[N-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	281	0	SW-846:8270C	2	10	65000	µg/L	NM HH OO
SVOA	608-93-5	Pentachlorobenzene	281	1	SW-846:8270C	3	10		µg/L	
SVOA	87-86-5	Pentachlorophenol	281	0	SW-846:8270C	2	10	15	µg/L	NM Aqu Chronic
SVOA	85-01-8	Phenanthrene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	108-95-2	Phenol	281	0	SW-846:8270C	1	10	860000	µg/L	NM HH OO
SVOA	129-00-0	Pyrene	281	1	SW-846:8270C	0.3	1	4000	µg/L	NM HH OO
SVOA	110-86-1	Pyridine	185	0	SW-846:8270C	3	10		µg/L	
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	281	0	SW-846:8270C	2	10	70	µg/L	NM HH OO
SVOA	95-95-4	Trichlorophenol[2,4,5-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	88-06-2	Trichlorophenol[2,4,6-]	281	0	SW-846:8270C	2	10		µg/L	
VOA	67-64-1	Acetone	309	64	SW-846:8260B	3.5	10		µg/L	
VOA	75-05-8	Acetonitrile	309	0	SW-846:8260B	6.3	25		µg/L	
VOA	107-02-8	Acrolein	309	2	SW-846:8260B	1.3	5	9	µg/L	NM HH OO
VOA	107-13-1	Acrylonitrile	309	0	SW-846:8260B	1	5		µg/L	
VOA	71-43-2	Benzene	309	2	SW-846:8260B	0.3	1	510	µg/L	NM HH OO
VOA	108-86-1	Bromobenzene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	74-97-5	Bromochloromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	75-27-4	Bromodichloromethane	309	9	SW-846:8260B	0.25	1		µg/L	
VOA	75-25-2	Bromoform	309	7	SW-846:8260B	0.25	1		µg/L	
VOA	74-83-9	Bromomethane	309	0	SW-846:8260B	0.3	1	1500	µg/L	NM HH OO
VOA	71-36-3	Butanol[1-]	219	0	SW-846:8260B	15	50		µg/L	
VOA	78-93-3	Butanone[2-]	309	7	SW-846:8260B	1.3	5		µg/L	
VOA	104-51-8	Butylbenzene[n-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	135-98-8	Butylbenzene[sec-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	98-06-6	Butylbenzene[tert-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-15-0	Carbon Disulfide	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	56-23-5	Carbon Tetrachloride	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	126-99-8	Chloro-1,3-butadiene[2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	107-05-1	Chloro-1-propene[3-]	294	0	SW-846:8260B	1.5	5		µg/L	
VOA	108-90-7	Chlorobenzene	309	0	SW-846:8260B	0.25	1	1600	µg/L	NM HH OO
VOA	124-48-1	Chlorodibromomethane	309	10	SW-846:8260B	0.3	1		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
VOA	75-00-3	Chloroethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	67-66-3	Chloroform	309	14	SW-846:8260B	0.25	1		µg/L	
VOA	74-87-3	Chloromethane	309	2	SW-846:8260B	0.3	1		µg/L	
VOA	95-49-8	Chlorotoluene[2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	106-43-4	Chlorotoluene[4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	106-93-4	Dibromoethane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	74-95-3	Dibromomethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	95-50-1	Dichlorobenzene[1,2-]	309	0	SW-846:8260B	0.25	1	1300	µg/L	NM HH OO
VOA	541-73-1	Dichlorobenzene[1,3-]	309	0	SW-846:8260B	0.25	1	960	µg/L	NM HH OO
VOA	106-46-7	Dichlorobenzene[1,4-]	309	1	SW-846:8260B	0.25	1	190	µg/L	NM HH OO
VOA	75-71-8	Dichlorodifluoromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	75-34-3	Dichloroethane[1,1-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	107-06-2	Dichloroethane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-35-4	Dichloroethene[1,1-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	156-59-2	Dichloroethene[cis-1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	156-60-5	Dichloroethene[trans-1,2-]	309	0	SW-846:8260B	0.3	1	10000	µg/L	NM HH OO
VOA	78-87-5	Dichloropropane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	142-28-9	Dichloropropane[1,3-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	594-20-7	Dichloropropane[2,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	563-58-6	Dichloropropene[1,1-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	10061-01-5	Dichloropropene[cis-1,3-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	10061-02-6	Dichloropropene[trans-1,3-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	60-29-7	Diethyl Ether	219	3	SW-846:8260B	0.3	1		µg/L	
VOA	97-63-2	Ethyl Methacrylate	309	0	SW-846:8260B	1	5		µg/L	
VOA	100-41-4	Ethylbenzene	309	0	SW-846:8260B	0.25	1	2100	µg/L	NM HH OO
VOA	87-68-3	Hexachlorobutadiene	309	0	SW-846:8260B	0.3	1	180	µg/L	NM HH OO
VOA	591-78-6	Hexanone[2-]	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	74-88-4	Iodomethane	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	78-83-1	Isobutyl alcohol	309	0	SW-846:8260B	13	50		µg/L	
VOA	98-82-8	Isopropylbenzene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	99-87-6	Isopropyltoluene[4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	126-98-7	Methacrylonitrile	309	0	SW-846:8260B	1	5		µg/L	
VOA	80-62-6	Methyl Methacrylate	309	0	SW-846:8260B	1	5		µg/L	
VOA	1634-04-4	Methyl tert-Butyl Ether	219	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-10-1	Methyl-2-pentanone[4-]	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	75-09-2	Methylene Chloride	309	2	SW-846:8260B	3	10		µg/L	

Table C-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
VOA	91-20-3	Naphthalene	309	1	SW-846:8260B	0.25	1		µg/L	
VOA	107-12-0	Propionitrile	309	0	SW-846:8260B	1.5	5		µg/L	
VOA	103-65-1	Propylbenzene[1-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	100-42-5	Styrene	309	1	SW-846:8260B	0.25	1		µg/L	
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	127-18-4	Tetrachloroethene	309	0	SW-846:8260B	0.3	1	33	µg/L	NM HH OO
VOA	108-88-3	Toluene	309	5	SW-846:8260B	0.25	1	15000	µg/L	NM HH OO
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	309	0	SW-846:8260B	1	5		µg/L	
VOA	87-61-6	Trichlorobenzene[1,2,3-]	309	0	SW-846:8260B	0.33	1		µg/L	
VOA	120-82-1	Trichlorobenzene[1,2,4-]	309	0	SW-846:8260B	0.3	1	70	µg/L	NM HH OO
VOA	71-55-6	Trichloroethane[1,1,1-]	309	2	SW-846:8260B	0.33	1		µg/L	
VOA	79-00-5	Trichloroethane[1,1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	79-01-6	Trichloroethene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-69-4	Trichlorofluoromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	96-18-4	Trichloropropane[1,2,3-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	95-63-6	Trimethylbenzene[1,2,4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-67-8	Trimethylbenzene[1,3,5-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-05-4	Vinyl acetate	309	0	SW-846:8260B	1.5	5		µg/L	
VOA	75-01-4	Vinyl Chloride	309	0	SW-846:8260B	0.5	1		µg/L	
VOA	95-47-6	Xylene[1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	Xylene[1,3 and 1,4]	Xylene[1,3-]+Xylene[1,4-]	308	0	SW-846:8260B	0.5	2		µg/L	

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels.

Table C-4.1-3
Analytes with PQLs above Groundwater Cleanup Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Herb	94-74-6	MCPA	388	0	SW-846:8151A	12	53	18			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Herb	93-65-2	MCPP	388	0	SW-846:8151A	11	53	37			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	1	µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA maximum contaminant level (MCL). The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	1912-24-9	Atrazine	2074	0	SW-846:8270C	3	10	3			µg/L	EPA MCL	Although the PQL is higher, the MDL is equal to the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	103-33-3	Azobenzene	2074	0	SW-846:8270C	2	10	1.3			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	92-87-5	Benzidine	2074	0	SW-846:8270C	3	10	0.00094			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	56-55-3	Benzo(a)anthracene	2074	6	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	50-32-8	Benzo(a)pyrene	2074	9	SW-846:8270C	0.2	1	0.2			µg/L	EPA MCL	Although the PQL is higher, the MDL is equal to the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	205-99-2	Benzo(b)fluoranthene	2074	10	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	111-44-4	Bis(2-chloroethyl)ether	2074	0	SW-846:8270C	2	10	0.12			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	2074	128	SW-846:8270C	2	10	6			µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	106-47-8	Chloroaniline[4-]	2074	0	SW-846:8270C	2	10	3.4			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	53-70-3	Dibenz(a,h)anthracene	2074	4	SW-846:8270C	0.2	1	0.029			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	2074	0	SW-846:8270C	2	10	1.5			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	2074	0	SW-846:8270C	3	10	2.9			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table C-4.1-3 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
SVOA	121-14-2	Dinitrotoluene[2,4-]	2074	14	SW-846:8270C	2	10	2.2			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8321; that PQL is below the EPA tap water screening level.
SVOA	88-85-7	Dinoseb	2074	0	SW-846:8270C	2	10	7			µg/L	EPA MCL	The Laboratory also analyzes this compound by SW-846:8151A; that PQL is below the EPA MCL.
SVOA	123-91-1	Dioxane[1,4-]	2010	119	SW-846:8270C	2	10	6.7			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	118-74-1	Hexachlorobenzene	2074	0	SW-846:8270C	2	10	1			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	87-68-3	Hexachlorobutadiene	2074	0	SW-846:8270C	2	10	8.6			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8260B; that PQL is below the EPA tap water screening level
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	2074	5	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	98-95-3	Nitrobenzene	2074	2	SW-846:8270C	3	10	1.2			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8321; that PQL is below the EPA tap water screening level
SVOA	55-18-5	Nitrosodiethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0014			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	62-75-9	Nitrosodimethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0042			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	2074	0	SW-846:8270C	3	10	0.024			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	2074	0	SW-846:8270C	2	10	0.096			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	930-55-2	Nitrosopyrrolidine[N-]	2074	0	SW-846:8270C	2	10	0.32			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	2074	0	SW-846:8270C	2	10	3.2			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	87-86-5	Pentachlorophenol	2074	1	SW-846:8270C	2	10	1			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	108-95-2	Phenol	2074	5	SW-846:8270C	1	10	5			µg/L	NM GW STD	Although the PQL is higher, the MDL is less than the NM groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	107-02-8	Acrolein	2543	2	SW-846:8260B	1.3	5	0.042			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table C-4.1-3 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
VOA	107-13-1	Acrylonitrile	2543	0	SW-846:8260B	1	5	0.45			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	126-99-8	Chloro-1,3-butadiene[2-]	2543	0	SW-846:8260B	0.3	1	0.16			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	2543	0	SW-846:8260B	0.3	1	0.2			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	106-93-4	Dibromoethane[1,2-]	2543	0	SW-846:8260B	0.25	1	0.05			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	126-98-7	Methacrylonitrile	2542	0	SW-846:8260B	1	5	1			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is equal to the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	75-09-2	Methylene Chloride	2543	15	SW-846:8260B	3	10	5			µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	96-18-4	Trichloropropane[1,2,3-]	2543	0	SW-846:8260B	0.3	1	0.0072			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels.

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory’s 2007 groundwater background report (LANL 2007, 095817).

[d] Lowest of background values for intermediate and regional groundwater as identified in the Laboratory’s 2010 groundwater background report (LANL 2010, 110535).

Table C-4.1-4
Analytes with PQLs above Groundwater Background Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Geninorg	NH3-N	Ammonia as Nitrogen	2706	497	EPA:350.1	0.016	0.05		0.04	0.07	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	Br(-1)	Bromide	2699	669	EPA:300.0	0.066	0.2		0.03	0.07	mg/L		The MDL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	ClO4	Perchlorate	3364	2541	SW-846:6850	0.05	0.2	4	0.05	0.48	µg/L	NM GW CONS	While the PQL is above background, the MDL and the PQL are less than the Consent Order screening value
Geninorg	TKN	Total Kjeldahl Nitrogen	3142	1084	EPA:351.2	0.033	0.1		0.04	0.29	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	TOC	Total Organic Carbon	2273	1898	SW-846:9060	0.33	1		0.33	0.07	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Al	Aluminum	4766	1573	SW-846:6010B	68	200	5000	68	68	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the NM groundwater standard.
Metals	Sb	Antimony	4757	130	SW-846:6020	0.5	3	6	0.5	0.5	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	As	Arsenic	4758	1054	SW-846:6020	1.5	5	10	4.32	3.43	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	1	µg/L	EPA MCL	The MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	B	Boron	4752	3373	SW-846:6010B	15	50	750	15.1	35.42	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the NM groundwater standard.
Metals	Cr	Chromium	5093	3290	SW-846:6020	2.5	10	50	1	4.74	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Co	Cobalt	4761	458	SW-846:6010B	1	5	50	0.5	1	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cu	Copper	4761	702	SW-846:6010B	3	10	1000	3	3	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the NM groundwater standard
Metals	Fe	Iron	4766	2600	SW-846:6010B	30	100	1000	21	30	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Pb	Lead	4756	857	SW-846:6020	0.5	2	15	0.5	0.5	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	Mn	Manganese	4766	2632	SW-846:6010B	2	10	200	2	36	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the NM groundwater standard.
Metals	Hg	Mercury	4732	103	EPA:245.2	0.066	0.2	2	0.06	0.07	µg/L	EPA MCL	The MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Ni	Nickel	4756	3849	SW-846:6020	0.5	2	200	1	2.98	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the NM groundwater standard.
Metals	Sn	Tin	4733	84	SW-846:6010B	2.5	10	22000	3.26	25	µg/L	EPA TAP SCRN LVL	While the PQL is above background, the MDL and the PQL are less than the EPA tap water screening level
Metals	V	Vanadium	4761	3819	SW-846:6010B	1	5	180	1	15.21	µg/L	EPA TAP SCRN LVL	While the PQL is above background, the MDL and the PQL are less than the EPA tap water screening level

Table C-4.1-4 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Metals	Zn	Zinc	4763	2777	SW-846:6010B	3.3	10	10000	2	3.3	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Am-241	Americium-241	2578	61	Alpha Spectroscopy	0.05		1.2	0.04	0.05	pCi/L	DOE DW DCG	The MDA is less than the DOE Derived Concentration Guidelines (DCG). The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Cs-137	Cesium-137	2552	3	Gamma Spectroscopy	8		120	5.8	6.92	pCi/L	DOE DW DCG	The minimum detectable activity is less than the DOE DCG. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	GROSSA	Gross alpha	1821	377	Gas Proportional Counting	3		15	2.98	2.75	pCi/L	EPA action level	The minimum detectable activity is less than the EPA action level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Sr-90	Strontium-90	2585	184	Gas Proportional Counting	0.5		8	0.29	0.51	pCi/L	EPA action level	The minimum detectable activity is less than the EPA action level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	H-3	Tritium	2454	1197	Liquid Scintillation Counting	250		20000	0.32	6.26	pCi/L	EPA action level	The MDL exceeds the background but is below the EPA action level. This background value was determined using data from a laboratory no longer under contract. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels.

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory's 2007 groundwater background report (LANL 2007, 095817).

[d] Lowest of background values for intermediate and regional groundwater as identified in the Laboratory's 2010 groundwater background report (LANL 2010, 110535).

Table C-4.1-5
Analytes with a PQL above Base-Flow Cleanup Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Screening Level[b]	Unit	Screening-Level Type	Comment
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	75	3	SW-846:8290		0.00001	5.1E-08	µg/L	NM HH OO	The PQL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cd	Cadmium	724	70	SW-846:6020	0.11	1	0.23	µg/L	NM Aqu Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cu	Copper	724	264	SW-846:6010B	3	10	4	µg/L	NM Aqu Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Pb	Lead	724	286	SW-846:6020	0.5	2	1	µg/L	NM Aqu Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Ag	Silver	724	78	SW-846:6020	0.2	1	0.7	µg/L	NM Aqu Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Tl	Thallium	724	69	SW-846:6020	0.3	1	0.47	µg/L	NM HH OO	Although the PQL is higher, the MDL is less than the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
PCB	12674-11-2	Aroclor-1016	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11104-28-2	Aroclor-1221	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11141-16-5	Aroclor-1232	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	53469-21-9	Aroclor-1242	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	12672-29-6	Aroclor-1248	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11097-69-1	Aroclor-1254	216	6	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11096-82-5	Aroclor-1260	216	7	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	37324-23-5	Aroclor-1262	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
Pest	309-00-2	Aldrin	197	1	SW-846:8081A	0.005	0.02	0.0005	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	5103-71-9	Chlordane[alpha-]	197	1	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	5103-74-2	Chlordane[gamma-]	197	2	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-54-8	DDD[4,4'-]	197	3	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-55-9	DDE[4,4'-]	197	5	SW-846:8081A	0.005	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table C-4.1-5 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Screening Level[b]	Unit	Screening-Level Type	Comment
Pest	50-29-3	DDT[4,4'-]	197	4	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	60-57-1	Dieldrin	197	2	SW-846:8081A	0.01	0.04	0.00054	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-20-8	Endrin	197	2	SW-846:8081A	0.01	0.04	0.036	µg/L	NM Aqu Chronic	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	76-44-8	Heptachlor	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	1024-57-3	Heptachlor Epoxide	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	8001-35-2	Toxaphene (Technical Grade)	197	0	SW-846:8081A	0.15	0.5	0.0002	µg/L	NM Aqu Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	50-32-8	Benzo(a)pyrene	281	3	SW-846:8270C	0.2	1	0.18	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	118-74-1	Hexachlorobenzene	281	0	SW-846:8270C	2	10	0.0029	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as result of logic provided in Appendix B-2.0, Protocol for Selecting Screening Levels.

Table C-4.2-1
Analytical Methods, PQLs, and MDLs for Analytes Reported by GGRL

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
General Inorganics					
Alkalinity-CO_3	EPA:310.1	Titrimetric	0.8	4	mg/L
Alkalinity-CO_3+HCO_3	EPA:310.1	Titrimetric	0.8	4	mg/L
Ammonia as Nitrogen	EPA:350.3	Ion selective electrode	0.1	0.5	mg/L
Bromide	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Calcium	EPA:200.7	ICP-AES[a]	0.01	0.05	mg/L
Chloride	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Fluoride	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Magnesium	EPA:200.7	ICP-AES	0.01	0.05	mg/L
Nitrite as Nitrogen	EPA:300.0	Ion chromatography	0.003	0.015	mg/L
Nitrate as Nitrogen	EPA:300.0	Ion chromatography	0.002	0.01	mg/L
Oxalate	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Perchlorate	EPA:314.0	Ion chromatography	2	10	µg/L
pH	EPA:150.1	pH meter	—[b]	—	SU
Phosphorus, Orthophosphate (Expressed as PO_4)	EPA:300.0	Ion chromatography	0.01	—	mg/L
Potassium	EPA:200.7	ICP-AES	0.01	—	mg/L
Sodium	EPA:200.7	ICP-AES	0.01	0.05	mg/L
Sulfate	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Total Organic Carbon	SW-846:9060	Carbonaceous analyzer	0.2	1	mg/L
Sulfide, Total	EPA:376.2	Colorimetric	0.01	0.05	mg/L
Metals					
Aluminum	EPA:200.7	ICP-AES	1	5	µg/L
Antimony	EPA:200.8	ICP-MS[c]	1	5	µg/L
Arsenic	EPA:200.8	ICP-MS	0.2	1	µg/L
Barium	EPA:200.7	ICP-AES	1	5	µg/L
Beryllium	EPA:200.8	ICP-MS	1	5	µg/L
Boron	EPA:200.7	ICP-AES	2	10	µg/L
Cadmium	EPA:200.8	ICP-MS	1	5	µg/L
Cesium	EPA:200.8	ICP-MS	1	5	µg/L
Chromium	EPA:200.8	ICP-MS	1	5	µg/L
Chromium Hexavalent Ion	SW-846:7196A	Ultraviolet–Visible Spectrophotometry	0.05	0.25	µg/L
Cobalt	EPA:200.8	ICP-MS	1	5	µg/L
Copper	EPA:200.8	ICP-MS	1	5	µg/L
Iron	EPA:200.7	ICP-AES	10	50	µg/L
Lithium	EPA:200.7	ICP-AES	1	5	µg/L
Lead	EPA:200.8	ICP-MS	0.2	1	µg/L
Manganese	EPA:200.7	ICP-AES	1	5	µg/L
Mercury	EPA:200.8	ICP-MS	0.05	0.25	µg/L

Table C-4.2-1 (continued)

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
Molybdenum	EPA:200.8	ICP-MS	1	5	µg/L
Nickel	EPA:200.8	ICP-MS	1	5	µg/L
Selenium	EPA:200.8	ICP-MS	1	5	µg/L
Silicon Dioxide	EPA:200.7	ICP-AES	0.0214	0.107	mg/L
Silver	EPA:200.8	ICP-MS	1	5	µg/L
Strontium	EPA:200.7	ICP-AES	1	5	µg/L
Thallium	EPA:200.8	ICP-MS	1	5	µg/L
Tin	EPA:200.8	ICP-MS	1	5	µg/L
Titanium	EPA:200.7	ICP-AES	2	10	µg/L
Uranium	EPA:200.8	ICP-MS	0.2	1	µg/L
Vanadium	EPA:200.8	ICP-MS	1	5	µg/L
Zinc	EPA:200.7	ICP-AES	1	5	µg/L
Isotope					
Deuterium Ratio	Generic:Deuterium Ratio	Isotope ratio mass spectrometry	—	—	permil
Oxygen-18/Oxygen-16 Ratio	Generic:Oxygen Isotope Ratio	Isotope ratio mass spectrometry	—	—	permil
Nitrogen-15/Nitrogen-14 Ratio	Generic:Nitrogen Isotope Ratio	Isotope ratio mass spectrometry	—	—	permil

[a] ICP-AES = inductively coupled plasma atomic emission spectroscopy.

[b] — = Not applicable.

[c] ICP-MS = inductively coupled mass spectrometry.

Table C-5.0-1
Waste Stream, Estimated Volumes, and Management of IDW

Waste Stream	Estimated Volume	On-Site Management and Final Disposition
Purge water	5 to 3000 gal. per well per sampling event	Land application per ENV-RCRA-SOP-010, Land Application of Groundwater
Contact waste	Less than 110 gal. per watershed monitoring campaign	Accumulation in 55-gal. drums with drum liners. Disposal off-site at a New Mexico solid waste landfill or on-site disposal at TA-54, Area G
Decontamination fluids	Less than 55 gal. per watershed monitoring campaign	Treatment at an on-site or Laboratory-approved off-site wastewater treatment facility for which waste meets waste acceptance criteria

Appendix D

Supplemental Information for Assigned Sampling Suites and Frequencies

Appendix D provides supplemental information relevant to sampling frequencies and analytical suites assigned to locations in each area-specific monitoring group or watershed. The following are primary considerations used to define sampling frequencies and analytical suites that are protective of groundwater:

- general types of contaminants released from upgradient sources
- extent to which contaminant nature and extent have been defined
- expected transport characteristics of the released contaminants
- frequency of detection of contaminants in the monitoring group
- magnitude of concentrations relative to the lowest applicable standard
- nature and rate of change of contaminant concentrations

The highest sampling frequencies apply to areas in which a mobile contaminant has been detected above a standard but where its nature and extent may not be characterized sufficiently to support decisions about potential remedial actions to be taken. Lower sampling frequencies apply to analytes that are not of significance for a given monitoring group, are relatively immobile in the subsurface, and have not been detected or have been detected infrequently.

The following general rules of thumb were used to define the lowest sampling frequencies for specific analytical suites (excluding those locations undergoing characterization sampling).

Inorganic Constituents. General inorganics and metals are sampled annually if these suites contain one or more significant contaminants for a monitoring group, the nature and extent of those constituents are well characterized, and additional data are not needed to support regulatory decision-making, such as an investigation report or a corrective measures evaluation (CME). To the extent that additional data are needed to meet project objectives or for new wells, the relevant analytical suite is sampled more frequently. Metals are not sampled from areas that have no evidence of metals migration. Perchlorate is sampled annually or more frequently in new wells and in the northern monitoring groups where it is a potentially significant constituent. Perchlorate is no longer sampled for in wells from the southern monitoring groups where it was not used.

Organic Constituents. The main characteristic used to determine the lowest sampling frequency for an organic analytical suite is the mobility of its constituents. Suites containing organic constituents with moderate to high mobility in the environment (volatile organic compounds [VOCs] and, to a lesser extent, semivolatile organic compounds [SVOCs]) are sampled annually or not sampled in areas for which there is a history of nondetections and where additional data are not needed to support regulatory decision-making, such as an investigation report or a CME. If consistently detected or if additional data are needed to meet project objectives, then the relevant suite is sampled annually or more frequently. Data from across Los Alamos National Laboratory show a history of nondetections for dioxins/furans, pesticides, and polychlorinated biphenyls (PCBs) in deeper groundwater zones. This is consistent with the expected inability for these highly adsorptive constituents to migrate to deeper groundwater zones. Therefore, these constituents have been eliminated from the groundwater sampling suite. Similarly, high explosives (HEXP) are not present in the northern watersheds (those north of Pajarito Canyon) and are not part of the analytical suite after initial characterization sampling of new wells has been completed.

Radionuclides (Excluding Tritium). If there is a history of nondetections or if detections fall within the range of natural background (for naturally occurring radionuclides), then the lowest sampling frequency applies, which is quarterly or semiannually for new wells, annual if radionuclides are among the significant constituents for an area being monitored, and biennial otherwise. The frequency is increased to semiannual if one or more radionuclides is detected above background, if the nature and extent of radionuclide constituents are not well characterized, or if additional data are needed to support decision-making.

Tritium. Tritium samples are collected only from springs and deep groundwater. Annual or higher frequencies apply except where tritium is not a significant contaminant, such as in the Technical Area 16 (TA-16) 260 monitoring group and in some general surveillance locations. Samples are collected for low-level tritium analysis at locations where a very low minimum detectable activity is useful to support a conceptual model for fate and transport.

Table D-1 provides background information and the objectives used to generally define the sampling frequencies and analytical suites for the area-specific monitoring groups. The specific sampling frequencies and analytical suites for individual sampling locations are provided in Tables 2.4-1 through 8.3-2 of the monitoring plan.

Table D-1
Background Information and Objectives Used to Determine Sampling Frequencies and Analytical Suites for Area-Specific Monitoring Groups

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
TA-21	• Nature and extent of groundwater contamination generally understood • No concentrations exceed standards or screening levels (SLs) in regional groundwater	• Quarterly sampling of new regional wells • Annual sampling of all other intermediate and regional wells	• Metals, VOCs, SVOCs, radionuclides, low-level tritium, general inorganics, and perchlorate analyses for all quarterly samples from new wells; HEXP semiannually at new wells • Radionuclides, tritium or low-level tritium, and general inorganics and perchlorate analyses annually for other wells • Annual VOC and SVOC analysis at R-6i	• Focus on mobile constituents and radionuclides
Chromium (Cr)	• Nature and extent of groundwater contamination generally understood • Cr concentrations in regional aquifer exceed New Mexico Groundwater Standard (NM GW STD) • Perchlorate concentrations in regional aquifer exceed Consent Order SL • No constituent concentrations exceed standards or SLs in regional groundwater • Cr concentrations at the down-gradient portion of the plume below NM GW STD and stable, especially in deeper screens where concentrations are at background concentrations	• Quarterly sampling of new regional wells • Quarterly sampling of intermediate and regional wells with chromium (Cr) concentrations that exceed 25 µg/L (half the NM GW STD) • Quarterly sampling of intermediate and regional wells with significant rate of change in Cr concentrations • Semiannual sampling of intermediate and regional wells with Cr concentrations that are above 10.44 µg/L (background upper tolerance limit) but less than 25 µg/L (half the NM GW STD) • Annual sampling of intermediate and regional with Cr concentrations at background levels	• Metals, general inorganics, and perchlorate analyses for all quarterly samples from new regional wells; VOCs, SVOCs, HEXP, radionuclides, and low-level tritium semiannually from new regional wells • Metals, general inorganics, and perchlorate analyses for all samples; perchlorate annually at R-44 and R-45 because of low concentrations • Annual VOC and SVOC analysis for samples from intermediate Mortandad Canyon wells with consistently detected 1,4-dioxane • Annual analysis for radionuclides at intermediate wells; biennial for regional wells that are not new	• Focus highest frequency sampling and analysis for mobile constituents, including perchlorate • Focus highest frequency sampling and analysis at locations with highest Cr concentrations • Monitor wells located where potential for greatest rate of change is possible because of the presence of Cr in the vadose zone • Monitor wells located at downgradient edge of Cr plume • Monitor wells located between Cr plume and water-supply wells

Table D-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
MDA C	• Current data sufficient to support remedy selection for Material Disposal Area (MDA) C CME • No concentrations of constituents exceed standards or SLs in regional groundwater • Determination that groundwater is protected is supported by vapor-phase VOC sampling conducted to date	• Semiannual sampling of all wells	• VOC, SVOC, and low-level tritium analyses for all samples • Metals analysis for all R-60 samples • Annual analysis for radionuclides and general inorganics for all locations	• Focus highest frequency analysis for mobile constituents known to be present beneath MDA C
TA-54	• Current data sufficient to support remedy selection; CMEs for MDAs G, H and L submitted to the New Mexico Environment Department (09/09/2011) • No constituent concentrations exceed standards or SLs in regional groundwater • Determination that groundwater is protected is supported by vapor-phase VOC sampling conducted to date	• Semiannual sampling of all intermediate and regional wells	• Metals, VOCs, SVOCs, HEXP, low-level tritium, general inorganics, and perchlorate analyses for all samples from new well R-55i; radionuclides annually • VOC and low-level tritium analyses for all other samples • Semiannual SVOC analysis for R-37 screen 1 (consistently detected 1,4-dioxane) • VOCs and low-level tritium analysis only at R-40 screen 1 because of low yield • Annual metals, SVOCs, radionuclides, general inorganics, and perchlorate analyses for all other locations	• Focus highest frequency analysis for mobile constituents known to present beneath TA-54 MDAs

Table D-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
TA-16-260	• Increased runoff following Las Conchas fire may impact near-surface hydrology and contaminant distributions • Nature and extent of groundwater contamination generally understood • RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) exceeds U.S. Environmental Protection Agency tap water SL in intermediate groundwater • No constituent concentrations exceed standards or SLs in regional groundwater • Historical rate of change in RDX concentrations doesn't require high-frequency (e.g., quarterly) sampling	• Monitor semiannually or annually at key base-flow location, alluvial monitoring wells, and springs • Semiannual sampling of new or reconfigured wells with an extra quarterly round in R-63 • Semiannual sampling of springs, and alluvial, intermediate, and regional wells with elevated RDX concentrations • Annual sampling of springs and wells without significant RDX detections	• Metals, VOCs, SVOCs, HEXP, low-level tritium, general inorganics, and perchlorate analyses for all samples from new or reconfigured wells; annual analysis for radionuclides • Metals, VOCs, and HEXP analyses for all other samples • Annual analysis for general inorganics and biennial analysis for radionuclides for all other locations	• Reestablish baseline conditions for shallow system following Las Conchas fire • Focus highest frequency analysis for mobile constituents known to be released at the 260 Outfall
MDA AB	• No constituent concentrations exceed standards or SLs in regional groundwater	• Annual sampling of all intermediate and regional wells	• Metals, VOCs, SVOCs, HEXP, radionuclides, low-level tritium, and general inorganics analyses for all samples	• General analyte suite for constituents that may have been released from MDA AB

Table D-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
General Surveillance	• Number of outfalls significantly reduced and remaining outfalls have improved water quality • Nature and extent of groundwater contamination generally understood • Canyons investigations are complete and show contribution to risk from surface water is low and within acceptable limits • Generally, constituent concentrations are below standards or SLs	• Continuous field-parameters sampling at key base-flow locations • Annual monitoring at key alluvial monitoring wells and springs to capture unexpected near-surface conditions • Annual sampling of all intermediate and regional wells	• Metals, radionuclides, general inorganics, and perchlorate analyses for all samples • Analysis of additional constituents at monitoring well 03-B-13 • HEXP analysis for southern watersheds • VOCs and SVOCs analysis for selected areas	• Focus highest frequency analysis for mobile constituents known to be present in particular watershed • Limit monitoring in the alluvial groundwater because of limited contamination • Focus on intermediate and regional locations for groundwater protection

* Constituents discussed in this column do not include detections of spurious organic constituents, naturally occurring constituents, or constituents related to well corrosion or to potential drilling effects.

Appendix E

Field Quality Assurance/Quality Control Samples

Sample Type	Summary
General	This appendix summarizes field quality assurance/quality control (QA/QC) samples to be collected during interim facility-wide groundwater monitoring activities. Field QA/QC samples are collected in accordance with the Compliance Order on Consent, Section IX.B and include field blanks, equipment rinsate blanks, performance evaluation blanks, field duplicates, and field trip blanks. Field QA/QC samples are used to detect possible field or analytical laboratory contamination and to track analytical laboratory performance. Differences in analytical results between field-duplicate samples, for example, may indicate the samples were not uniform or significant variation occurred during analyses. Detection of analytes in deionized water field blanks may indicate contamination of the deionized water source or sample bottles or contamination from the analytical laboratory. This summary also addresses how field QA/QC results are used and the types of corrective actions that may be taken to address exceedances of target measures for each QA/QC sample type.
Field Blanks	Field blanks are used to monitor for contamination during sampling and are collected at a minimum frequency of 10% of all samples collected in a sampling campaign. Field blanks are collected by filling sample containers in the field with deionized water to check for sources of sample contamination in the field. Field blanks are analyzed for the organic constituents sampled for during the sampling campaign, with the exception of high explosive compounds, which are not analyzed in field or equipment rinsate blanks. Field-blank results are evaluated as part of the secondary data validation process by using the results to validate the associated sample results. If any analytes are detected in the field blank, the result from the associated sample is qualified as undetected if the result is less than 5 times the amount for the analyte found in the associated field blank. A validation reason code is also assigned to describe why the data were qualified.
Equipment Rinsate Blanks	Equipment rinsate blanks are used to detect any contamination resulting from contaminated equipment or poor decontamination techniques. The equipment rinsate blank is prepared by passing deionized water through unused or decontaminated sampling equipment, including Westbay sample bottles. Equipment rinsate blanks are collected before a well is sampled with a nondedicated pump. An equipment rinsate blank is also collected before sampling each well equipped with a Westbay sampling system for which samples are being collected for off-site analysis. Equipment rinsate blanks are not required for wells equipped with Westbay sampling systems from which samples are being collected only for on-site analysis. Equipment rinsate blanks are analyzed for the organic constituents sampled for in the associated well, with the exception of high explosive compounds, which are not analyzed in rinsate blanks. During the secondary data validation process, equipment rinsate blanks are evaluated in the same manner as field blanks, and any detected analytes are qualified in the samples associated with the equipment rinsate blank.
Performance Evaluation Blanks	Performance evaluation blanks (PEBs) are deionized water blanks submitted as regular samples, without any indication that they are QC samples. PEBs are used to evaluate the reagent-grade deionized water used to decontaminate sampling equipment and to prepare the blank samples discussed above. One PEB is collected per sampling campaign and analyzed for total organic carbon and for the full suite of constituents analyzed during the watershed sampling campaign, including metals, organic chemicals, general inorganics, and radionuclides. PEBs are not analyzed for stable isotopes or specialized analytes that may be requested for the sampling campaign.

Sample Type	Summary
Field Duplicates	Field duplicates are split samples that provide information about field variation of sampling results as well as analytical laboratory variation. They may reveal sampling techniques with poor reproducibility and provide information on the reproducibility of the sampling process. Field duplicates are collected at a rate of 10% of all samples collected in a sampling campaign. Field-duplicate samples should be distributed proportionally among surface water, alluvial groundwater, and intermediate/regional groundwater to the relative number of samples collected for each type of media. Field-duplicate samples are selected from robust sampling locations requiring full analytical suites and yielding plenty of sample volume. Field-duplicate samples should be analyzed for the same suite of analytes for which the primary samples are analyzed. However, field-duplicate samples need not be analyzed for specialized nonroutine analytes that may be requested for a sampling campaign, unless directed by the project leader. These analytes include stable isotopes and parameters for which microfiltration is requested. Field-duplicate results are compared with the associated sample results, and a relative percent difference is calculated. The acceptable threshold for relative percent differences is 20% for data greater than 5 times the reporting limit.
Field Trip Blanks	Field trip blanks accompany samples collected for volatile organic compound (VOC) analyses and are used to identify potential VOC contamination that may occur during sample handling, shipping, and storage or at the analytical laboratory. Field trip blanks consist of organic-free deionized water prepared by an independent off-site laboratory and are analyzed only for VOCs. A minimum of one trip blank is required for each cooler containing samples for VOC analyses. However, to facilitate data validation and verification, one trip blank may be included with each sample submitted for VOC analysis. During the secondary data validation process, field trip blanks are evaluated the same as field blanks, and any detected analytes are qualified in the samples associated with the trip blank. If any analytes are detected in the field trip blank, the result from the associated sample is qualified as undetected if the result is less than 5 times the amount of the concentration of the analyte found in the associated field blank. These results are given a validation reason code to describe why the data were qualified.
QA/QC Corrective Actions	Exceedances of target measures for each of the QA/QC sections summarized above triggers any number of potential corrective actions. Potential corrective actions are considered on a case-by-case basis and generally follow a graded approach. Corrective actions to be considered include the following. **Data review/focused validation:** A typical first step is to review field paperwork (e.g., chains-of-custody forms, sample collection logs) to ensure sample identifiers align with analytical results. Detailed data review and focused validation may also provide insights into improper use of sample preservatives and other similar errors in sample collection. **Reanalysis:** Review of QA/QC results sometimes detects problems that occur with sample analysis. In these instances, reanalysis of an aliquot of the original sample may be requested of the analytical laboratory, assuming no holding-time issues are associated with the sample aliquot. **Resampling:** If the QA/QC problem is not resolved using the approaches described above, resampling may be necessary. The decision to resample depends largely on the schedule for the subsequent sampling round. For instance, if a site is sampled quarterly, the sample collected for that round should suffice in filling the data gap. If the site is sampled annually, it may be necessary to resample after the discovery of a QA/QC concern if it would result in an important data gap. If an unacceptable QA/QC condition persists, then determining the source of the problem and making root-level corrections in a specific portion of the process will be initiated. For example, corrections or modifications may be made to an equipment decontamination process.

Appendix F

Protocols for Assessing
the Performance of Deep Groundwater Monitoring Wells

F-1.0 OBJECTIVES AND SCOPE

This appendix establishes a “watch list” identifying perched-intermediate and regional groundwater monitoring wells (hereafter referred to as the deep monitoring wells) for which the representativeness of water-quality data for certain constituents is questionable. These deep monitoring wells are sampled at Los Alamos National Laboratory (the Laboratory) under the Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan). Table F-1.0-1 lists the preliminary watch list of deep monitoring wells for the 2011 Interim Monitoring Plan, and describes the reason for this condition.

This appendix describes approaches for tracking the performance of deep monitoring wells at the Laboratory under the Interim Monitoring Plan.

- Section F-2.0 identifies deep monitoring wells that are purged less than 3 casing volumes (CVs).
- Section F-3.0 defines a protocol for assigning deep monitoring wells to watch lists with appropriate follow-up actions when questions arise concerning the reliability and representativeness of water-quality data from those wells.
- Section F-4.0 outlines an approach for conducting reliability assessments of deep monitoring wells to determine their capability for producing representative water-quality samples and to identify any potential effects of well installation, rehabilitation, or sampling protocol on data quality.

One well is also included on the watch list because of possible construction issues. In addition to wells described in Table F-1.0-1, the representativeness of new water quality samples from other wells is continually reviewed for possible addition to the watch list. The results from newly drilled wells and recently converted Westbay wells are part of this evaluation.

Inclusion of a well on the watch list is intended to be used as a general indicator of data quality and should not be construed as a definitive identification of data usability. The watch list is also dynamic insofar as it will be updated as conditions evolve. Changes will occur when additional water-quality data justify the removal or addition of wells from the list.

F-2.0 DEEP WELLS WITH LIMITED PURGE VOLUMES

Water that remains in a monitoring well for a period of time may not be representative of formation water because of physical, chemical, or biological changes that may occur as the water remains in contact with the well casing, dedicated sampling equipment, and the air space in the upper casing. This stagnant water may not represent formation water at the time of sampling. To ensure samples collected from a monitoring well are representative of formation water, stagnant water in the casing is generally removed (i.e., purged) from the sampling zone within the well before it is sampled. As prescribed in Standard Operating Procedure (SOP) EP-DIV-SOP-20032, Groundwater Sampling, the Laboratory’s standard practice is to purge perched-intermediate and regional wells a minimum of 3 CVs plus the volume of the drop pipe and to continue purging until water-quality parameters stabilize. Once the parameters stabilize, it is presumed that all stagnant water has been removed from the well and that fresh formation water is available for sampling.

However, purging 3 CVs is not always possible or feasible, particularly in low-producing monitoring wells that purge dry at low pumping rates. SOP-EP-DIV-SOP-20032 allows deviation from the 3-CV purge requirement for such conditions. However, data users may want to be aware of deep wells at which the 3-CV purge requirement generally cannot be met to consider potential impacts for data reliability. Table F-1.0-1 lists deep well screens which cannot meet the 3-CV purge requirement and describes the reason for this condition.

F-3.0 WATCH LIST ASSIGNMENTS

This appendix section discusses additional watch list criteria for deep monitoring wells in this Interim Plan for which the representativeness of water-quality data is questionable.

Data examined for the assessment includes field parameters monitored during purging before sample collection, field parameters associated with samples at the time of collection, major-ion concentrations, trace-metal concentrations, and detections of organic constituents. The assessments are based on site-specific geochemical criteria. The assessment may result in recommendations concerning the well's configuration, sampling protocols (such as purging volumes), extension or limitation of the analytical suites to be collected from the well screen, or caveats about data usability.

The specific objective of a reliability assessment is to determine the current reliability of a well (including its sampling system) as it relates to the water-quality data objectives of the specific monitoring network to which it is assigned. In general, reliability assessments may be conducted for a subset of the wells assigned to the watch list described in the preceding section or for deep wells within the context of a specific monitoring network.

The watch list presented in Table F-1.0-1 includes deep well screens for which field parameters monitored during purging consistently fail to meet stability criteria as well as deep well screens which show anomalous chemistry data suggesting groundwater in the screened interval may not be fully equilibrated following construction or rehabilitation. Table F-1.0-1 also provides the rationale for each listed well screen and lists recommended follow-up actions.

F-4.0 RELIABILITY ASSESSMENT PROTOCOL

The specific objective of a reliability assessment is to determine the current reliability of a well (including its sampling system) as it relates to the water-quality data objectives of the specific monitoring network to which it is assigned. In general, reliability assessments may be conducted for a subset of the wells assigned to the watch lists described in the preceding section or for deep wells within the context of a specific monitoring network.

Data examined for the assessment includes field parameters monitored during purging before sample collection, field parameters associated with samples at the time of collection, major-ion concentrations, trace-metal concentrations, and detections of organic constituents. The assessments are based on site-specific geochemical criteria and generally focus on data obtained for the four most recent sampling events. The assessment may result in recommendations concerning the well's configuration, sampling protocols (such as purging volumes), extension or limitation of the analytical suites to be collected from the well screen, or caveats about data usability.

Field parameters. Time-series data for field parameters monitored during purging before sample collection are examined for attainment of stable values by the end of purging. Stabilization criteria are prescribed in SOP EP-DIV-SOP-20032, Groundwater Sampling, and are derived from the stabilization criteria recommended by EPA (Yeskis and Zavala 2002, 204429) and from the Compliance Order on Consent (the Consent Order). The most sensitive indicator parameters are dissolved oxygen (DO) and turbidity. Other parameters such as water temperature, specific conductance, pH, and oxidation-reduction potential (ORP) are also monitored but are considered less sensitive indicators of formation water.

Field parameters are examined for stability during individual sampling events, and trends are compared for a sequence of events at the same location. Final field-parameter values associated with the sample at the time of collection are compared with the range observed in background locations for perched-intermediate groundwater and regional groundwater.

Inorganic analytes. Analytical data for common inorganic ions and trace metals are examined for stability and for excursions from background concentrations as follows:

- trends in concentrations of key indicators for the presence of the specific materials used in the screened interval, such as sodium, sulfate, and total organic carbon (TOC);
- trends in relative concentrations of major ions; and
- comparison of concentrations for major ions and selected trace metals with lower and upper concentration ranges for plateau-scale and site-specific background groundwater, as described below.

Concentration trends may be depicted using time-series plots, standard trilinear diagrams, or modified Schoeller plots.

- Trilinear diagrams, also called Piper plots, show major ions as percentages of milliequivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100%, and the data points in the two triangles are projected onto an adjacent grid. The main purpose of the Piper diagram is to show clustering of data points to indicate samples that have similar compositions.
- Schoeller plots are semilogarithmic diagrams originally developed to represent major ion analyses in meq/L and to demonstrate different hydrochemical water types on the same diagram. This type of graphical representation has the advantage that, unlike the trilinear diagrams, actual sample concentrations are displayed and compared. The modified Schoeller plot used for the reliability assessment represents analyses as mg/L or µg/L to avoid the need to make assumptions about ion speciation, which may be particularly problematic for trace metals.

Organic analytes. Detections of volatile and semivolatile organic compounds are compiled for examination of temporal trends and comparison against area-specific chemicals of potential concern.

Field documentation. As appropriate, field notes, groundwater sampling logs, and sample collection logs for each sampling event are also examined for observations about unusual odors, colors, or other indications of impacted water samples.

Plateau-scale background values for assessment. For naturally occurring analytes, statistical summaries of water-quality data for background groundwater locations establish a range of concentrations against which data from the assessed wells are compared for a preliminary assessment step. Lower and upper bounds of plateau-scale background ranges used in the reliability assessments are derived primarily from statistical tables in the most recent New Mexico Environment Department– (NMED-) approved Groundwater Background Investigation Report.

Site-specific background values for assessment. Representativeness may be assessed with greater specificity by comparing analytical concentrations with those in groundwater from other deep wells in sufficiently similar hydrogeologic settings and at which effects from downhole materials or local contaminants are known to be absent or negligible. The approach allows for the inclusion of wells not hydraulically upgradient of the well being assessed. This is similar to the interwell comparison approach described in sections 5.2.4 and 6.3.2 of the EPA guidance document, “Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities” (“Unified Guidance”) (EPA 2009, 110369). The development and use of site-specific background values is illustrated in the Reliability Assessment of Well R-47i (LANL 2011, 201564).

Under some conditions, some or all of the constituents measured in the sample collected at the end of development may also be appropriate to use as the basis of site-specific background values or to augment the background dataset compiled for the interwell comparison. This is similar to the intrawell comparison approach described in sections 5.2.4 and 6.3.2 of EPA's Unified Guidance (EPA 2009, 110369).

F-5.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), March 2009. "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance," EPA 530-R-09-007, Office of Resource Conservation and Recovery, Washington, D.C. (EPA 2009, 110369)

LANL (Los Alamos National Laboratory), March 2011. "Reliability Assessment for Well R-47i," Los Alamos National Laboratory document LA-UR-11-0933, Los Alamos, New Mexico. (LANL 2011, 201564)

Yeskis, D., and B. Zavala, May 2002. "Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers," a *Ground Water Forum Issue Paper*, EPA 542-S-02-001, Office of Solid Waste and Emergency Response, Washington, D.C. (Yeskis and Zavala 2002, 204429)

Table F-1.0-1
Preliminary Watch List of Deep Monitoring Wells in the 2011 Interim Plan

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
Limited Water Volume				
MCOI-4	Cr Investigation	Limited water volume	Low volume of water. Field parameters do not stabilize.	Prioritize analytical suites for collection
SCI-1	Cr Investigation	Limited water volume	Low volume of water. Field parameters do not stabilize.	Prioritize analytical suites for collection
R-26 PZ-2	TA-16 260	Limited water volume	Sampled with bailer. Often bails dry. High turbidity.	Prioritize analytical suites for collection
R-40 S1	TA-54	Limited water volume	Low volume of water. Typically yields only 1 CV	Prioritize analytical suites for collection
Water-Quality Issues				
R-61 S1	Cr Investigation	High iron and manganese	Two sample events, concentrations rising.	Track performance and propose action if appropriate
R-61 S2	Cr Investigation	High iron and manganese	Two sample events, concentrations rising.	Track performance and propose action if appropriate
R-25 S1	TA-16 260	Steel corrosion	Westbay screen. Unreliable metal data from steel corrosion.	Do not sample for metals. Final disposition will be proposed in TA-16 monitoring well network evaluation.
R-40 Si (formerly R-40i)	TA-54	High iron, manganese	Residual drilling effects	Track performance and propose action if appropriate
R-54 S1	TA-54	High iron and manganese	Seven sampling events, concentrations high	Track performance and propose action if appropriate

Appendix G

Geologic Cross-Sections

This appendix presents six east-west and three north-south geologic cross-sections that show the relationship of sampling locations in this Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan) to the hydrogeologic setting of the Los Alamos National Laboratory (the Laboratory) site. Figure G-1 is an overview of the cross-section locations.

The east-west cross-sections follow the stream channel in the following canyons:

- A–A' Water Canyon/Cañon de Valle (Figure G-2)
- B–B' Pajarito Canyon (Figure G-3)
- C–C' Mortandad Canyon (Figure G-4)
- D–D' Sandia Canyon (Figure G-5)
- E–E' Los Alamos Canyon (Figure G-6)
- F–F' Pueblo Canyon (Figure G-7)

The north-south cross-sections are distributed across the Laboratory site and include the following:

- G–G' in the eastern part of the Laboratory (Figure G-8)
- H–H' in the central part of the Laboratory (Figure G-9)
- I–I' in the western part of the Laboratory (Figure G-10)

The cross-sections are based on the three-dimensional geologic framework model (GFM) for the Laboratory that was developed using borehole and outcrop map data. The geologic model used in this report is an updated version of the Laboratory's fiscal year (FY) 2009 three-dimensional geologic framework model (Cole et al. 2010, 106101). The GFM was developed using the geospatial modeling software EarthVision, developed by Dynamic Graphics, Inc., in 2008. The updated GFM model is designated WC11a and incorporates new regional and perched intermediate wells installed since 2009, reinterpretation of stratigraphic contacts in a few existing well logs, and the addition of shallow Technical Area 21 (TA-21) and data that were not incorporated into the FY2009 model. The cross-sections were generated using the updated WC11a model to best represent the current conceptual understanding of the Laboratory's hydrogeology.

No faults are presented on the cross-sections because no known or mapped faults lie within the GFM domain used to develop these geologic cross-sections. Buried, inferred, and possible faults have not yet been incorporated into the WC11a model.

The cross-sections show sampling locations that fall within a 1500-ft buffer on both sides of the respective transect lines. Perched-intermediate and regional monitoring wells are shown as vertical lines, and the locations of well screens are shown as boxes presented to actual scale. Wells located within 500 ft of transects are indicated by solid lines, and wells offset more than 500 ft are demarcated by a dashed pattern. Because of their offset from the transect, some well screens in the outer portions of the buffer zones may not appear to plot within the proper geologic unit because of dipping geologic contacts. The relative positions of alluvial wells, surface-water sampling stations, and springs located along the transects are arrayed horizontally above the cross-sections to show the spatial relationship between the shallow, intermediate, and deep water-quality monitoring network and the GFM. Only sampling locations in the 2011 Interim Plan are shown on the cross-sections.

REFERENCE

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the New Mexico Environment Department Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Cole, G., D. Coblentz, E. Jacobs, D. Koning, D. Broxton, D. Vaniman, F. Goff, and G. WoldeGabriel, April 2010. "The 2009 Three-Dimensional Geologic Models of the Los Alamos National Laboratory Site, Southern Española Basin, and Española Basin," Los Alamos National Laboratory document LA-UR-09-3701, Los Alamos, New Mexico. (Cole et al. 2010, 106101)

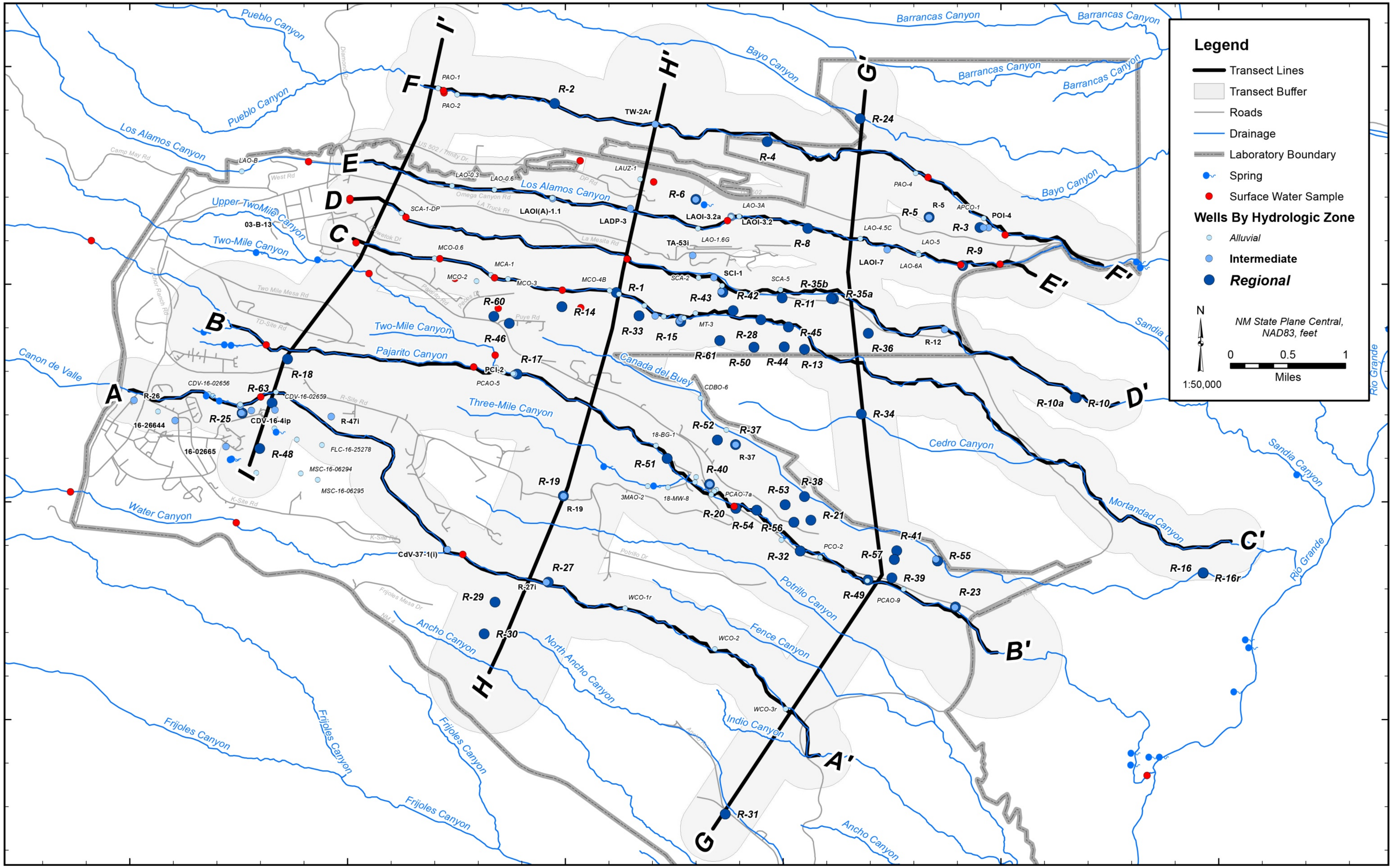
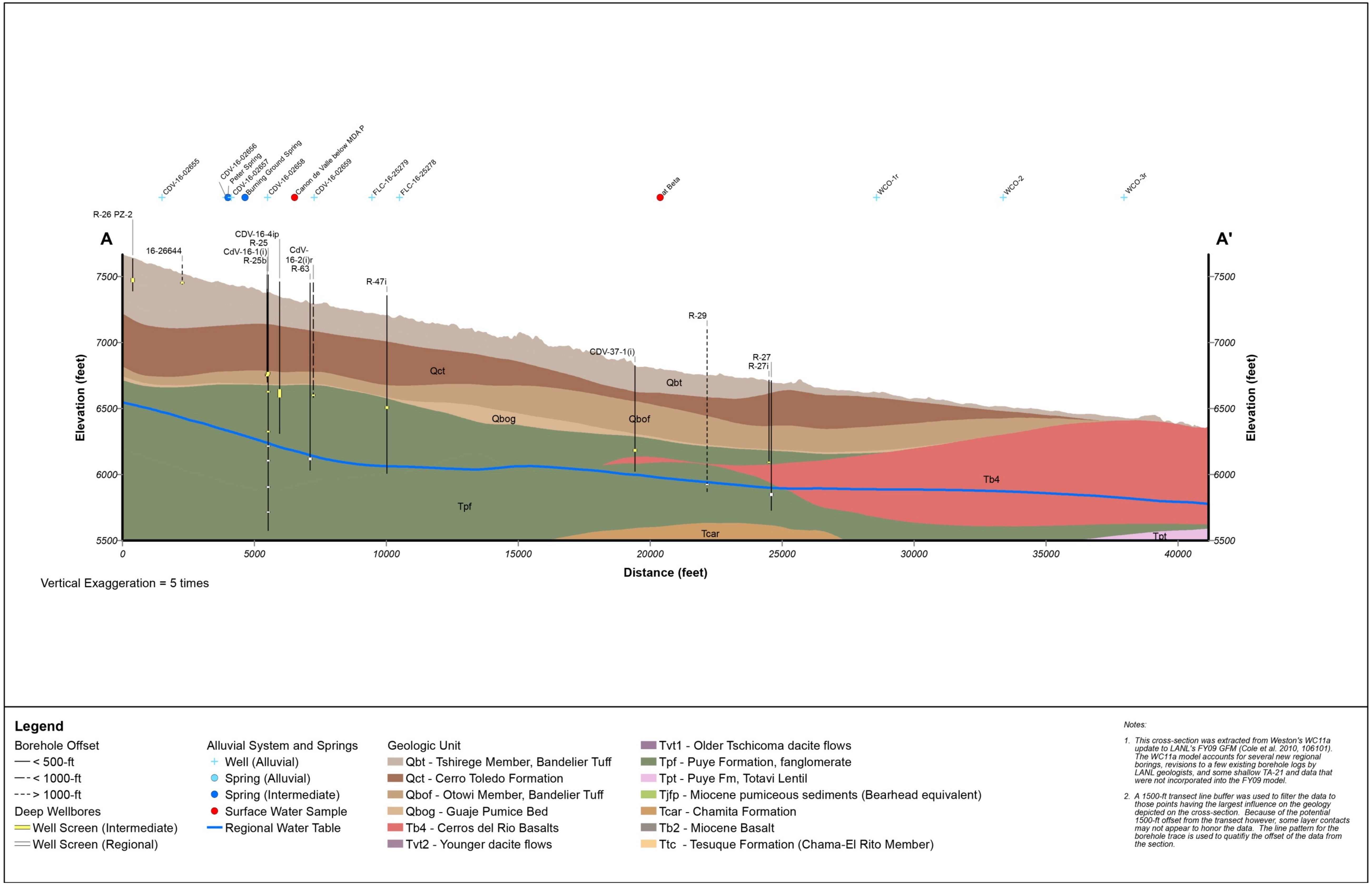


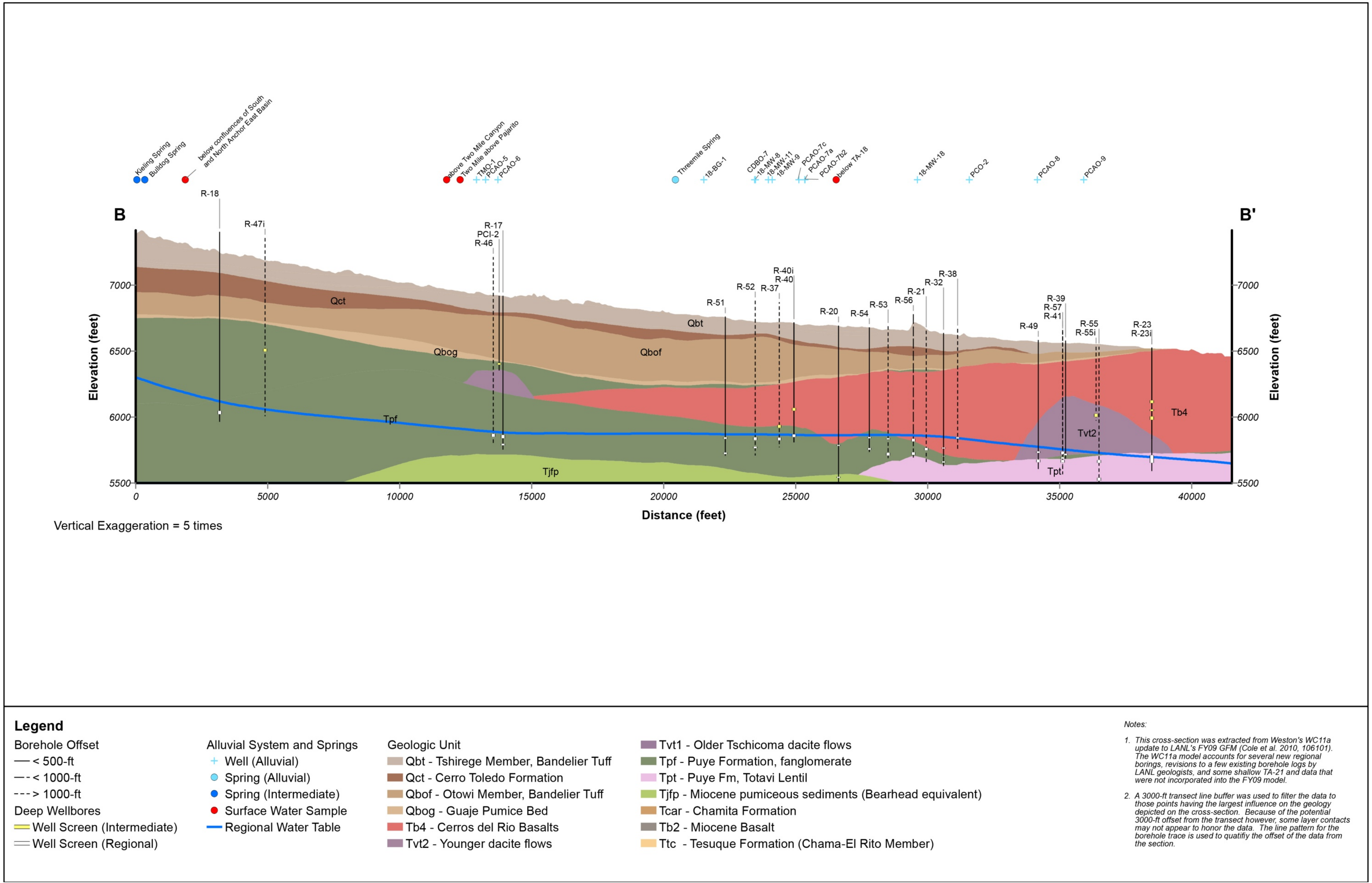
Figure G-1 Transect location map



Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

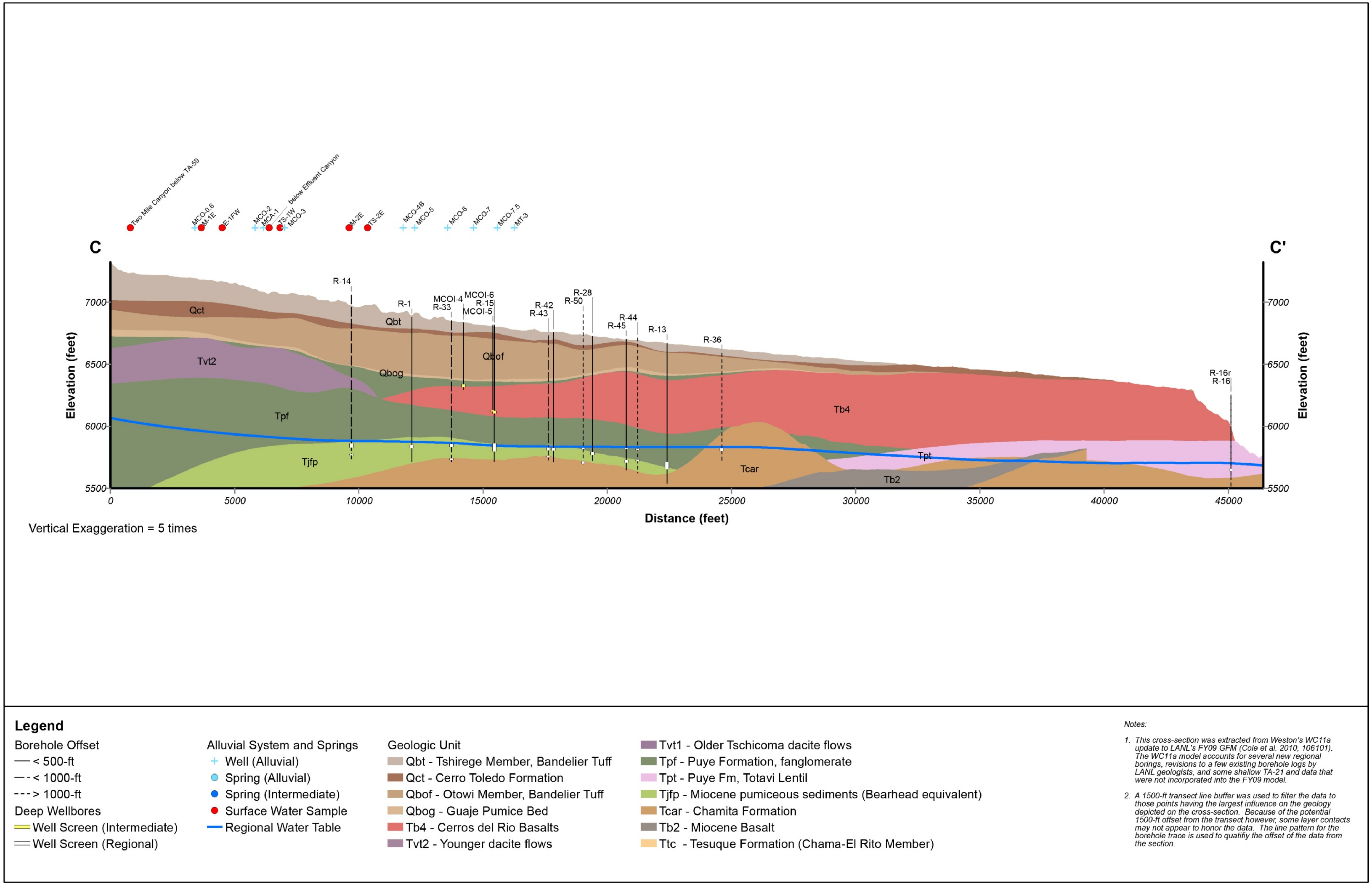
Figure G-2 Cross-section A–A′ Water Canyon/Cañon de Valle



Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 3000-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 3000-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

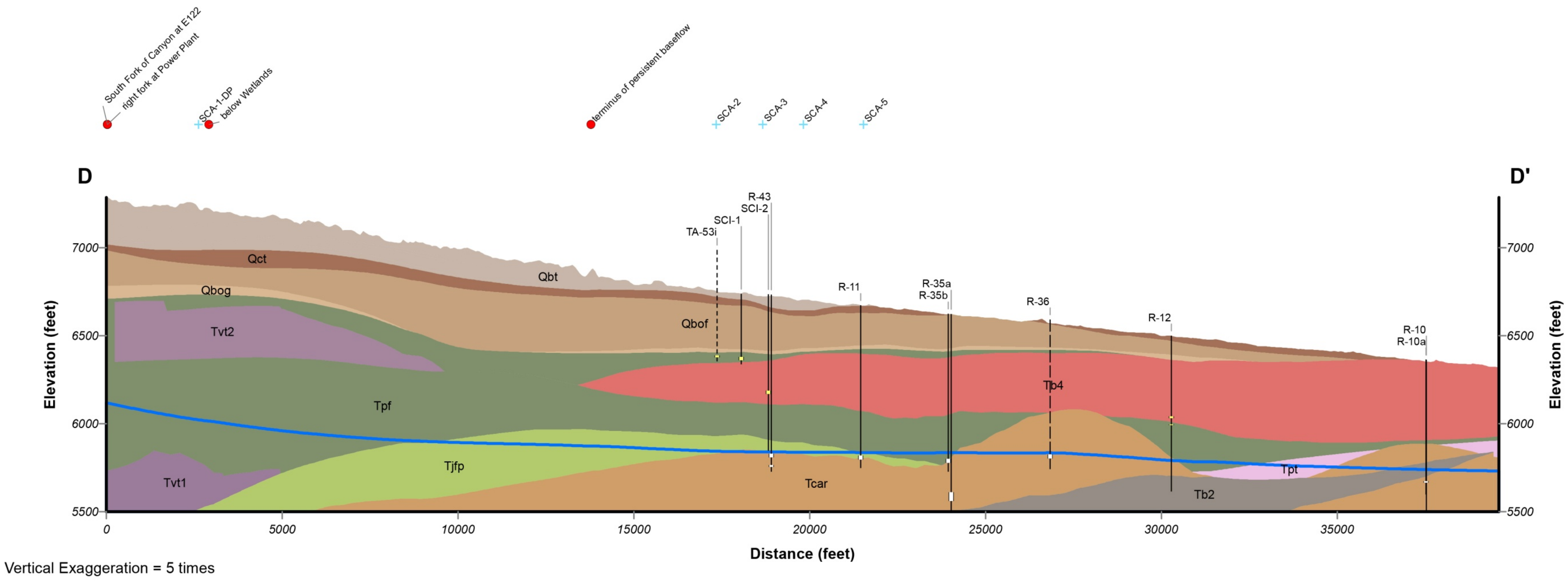
Figure G-3 Cross-section B–B′ Pajarito Canyon



Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

Figure G-4 Cross-section C–C′ Mortandad Canyon



Legend

Borehole Offset
— < 500-ft
—·- < 1000-ft
- - - > 1000-ft
Deep Wellbores
═ Well Screen (Intermediate)
═ Well Screen (Regional)

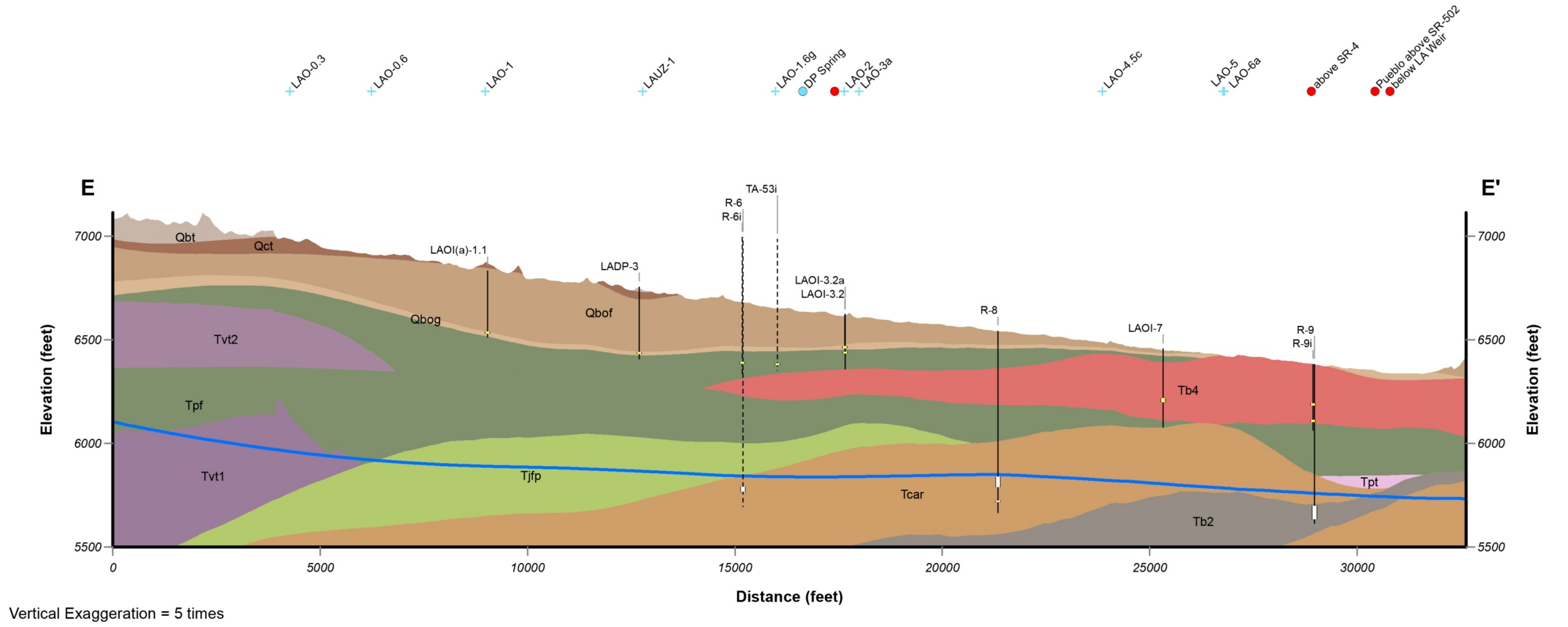
Alluvial System and Springs
+ Well (Alluvial)
● Spring (Alluvial)
● Spring (Intermediate)
● Surface Water Sample
— Regional Water Table

Geologic Unit
▨ Qbt - Tshirege Member, Bandelier Tuff
▨ Qct - Cerro Toledo Formation
▨ Qbof - Otowi Member, Bandelier Tuff
▨ Qbog - Guaje Pumice Bed
🟥 Tb4 - Cerros del Rio Basalts
▨ Tvt2 - Younger dacite flows
▨ Tvt1 - Older Tschicoma dacite flows
🟩 Tpf - Puye Formation, fanglomerate
▨ Tpt - Puye Fm, Totavi Lentil
▨ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
▨ Tcar - Chamita Formation
▨ Tb2 - Miocene Basalt
▨ Ttc - Tesuque Formation (Chama-El Rito Member)

Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1100-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1100-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

Figure G-5 Cross-section D–D′ Sandia Canyon



Vertical Exaggeration = 5 times

Legend

Borehole Offset
— < 500-ft
—·- < 1000-ft
- - - > 1000-ft
Deep Wellbores
═ Well Screen (Intermediate)
═ Well Screen (Regional)

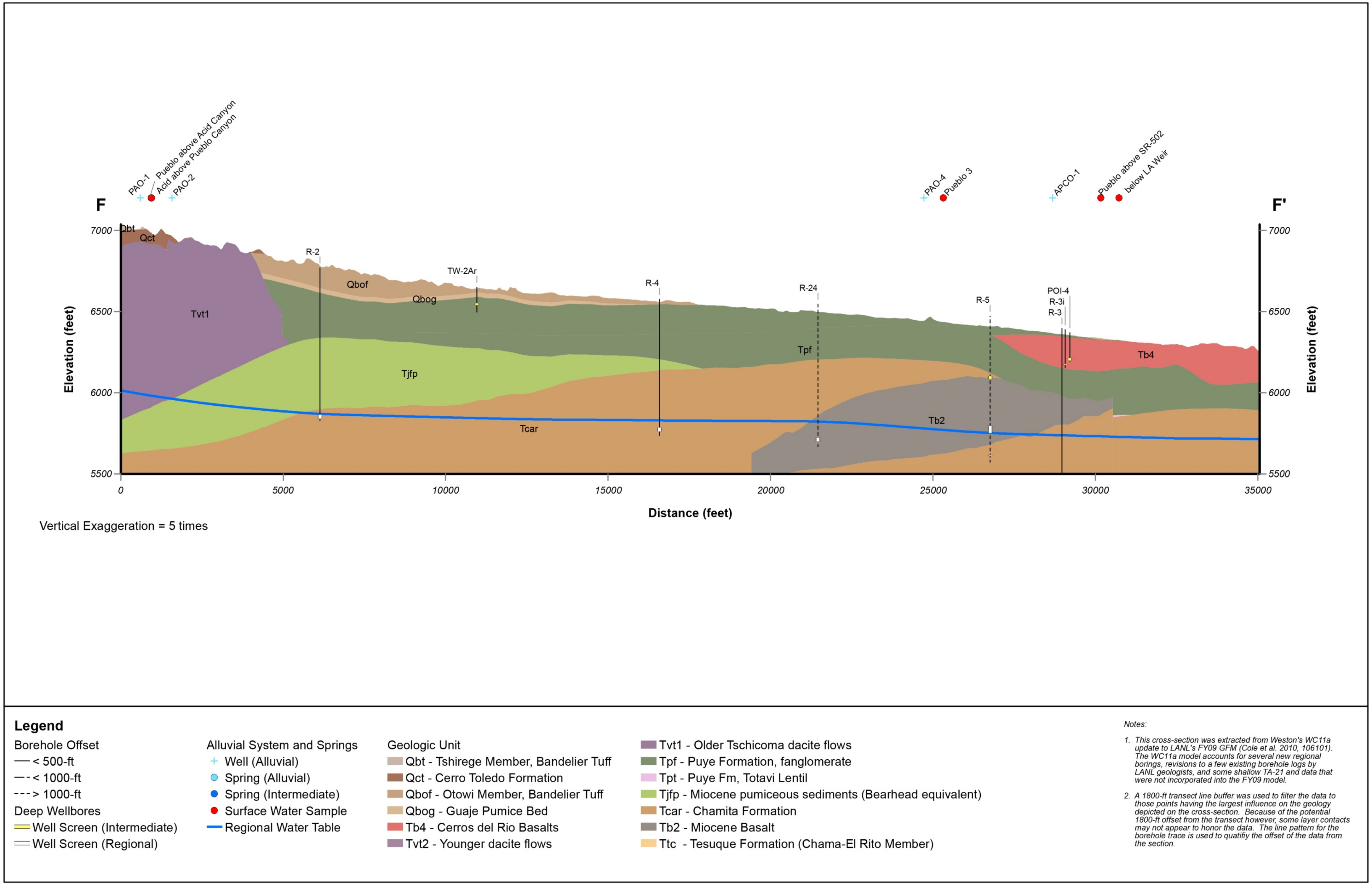
Alluvial System and Springs
+ Well (Alluvial)
○ Spring (Alluvial)
● Spring (Intermediate)
● Surface Water Sample
— Regional Water Table

Geologic Unit
▨ Qbt - Tshirege Member, Bandelier Tuff
▨ Qct - Cerro Toledo Formation
▨ Qbof - Otowi Member, Bandelier Tuff
▨ Qbog - Guaje Pumice Bed
▨ Tb4 - Cerros del Rio Basalts
▨ Tvt2 - Younger dacite flows
▨ Tvt1 - Older Tschicoma dacite flows
▨ Tpf - Puye Formation, fanglomerate
▨ Tpt - Puye Fm, Totavi Lentil
▨ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
▨ Tcar - Chamita Formation
▨ Tb2 - Miocene Basalt
▨ Ttc - Tesuque Formation (Chama-El Rito Member)

Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

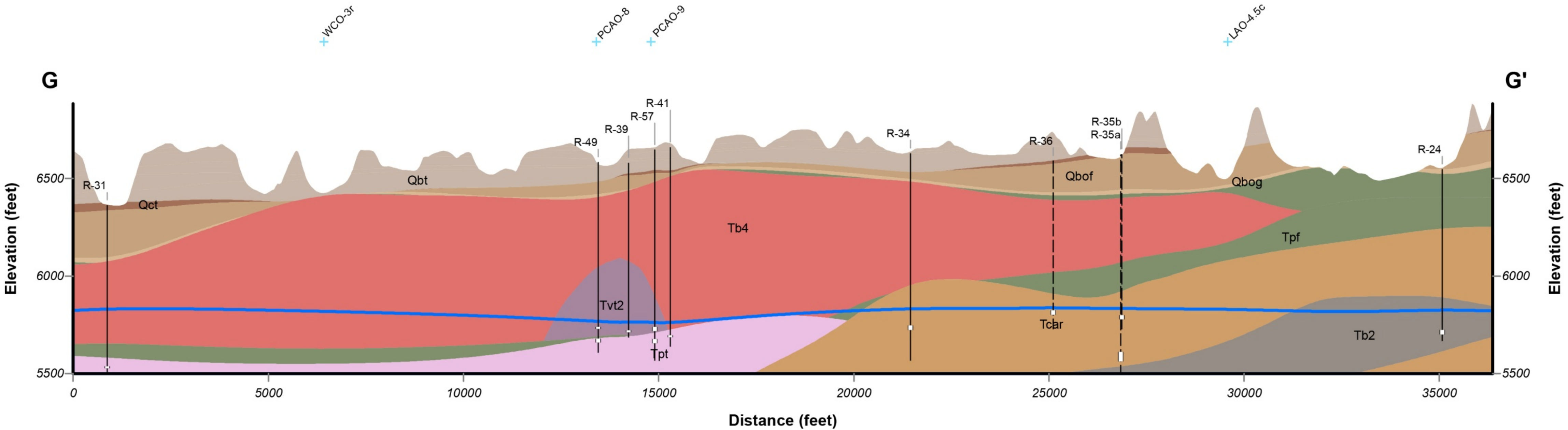
Figure G-6 Cross-section E–E′ Los Alamos Canyon



Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1800-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1800-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

Figure G-7 Cross-section F–F′ Pueblo Canyon



Vertical Exaggeration = 5 times

Legend

Borehole Offset
— < 500-ft
—- < 1000-ft
- - -> 1000-ft
Deep Wellbores
═ Well Screen (Intermediate)
═ Well Screen (Regional)

Alluvial System and Springs
+ Well (Alluvial)
● Spring (Alluvial)
● Spring (Intermediate)
● Surface Water Sample
— Regional Water Table

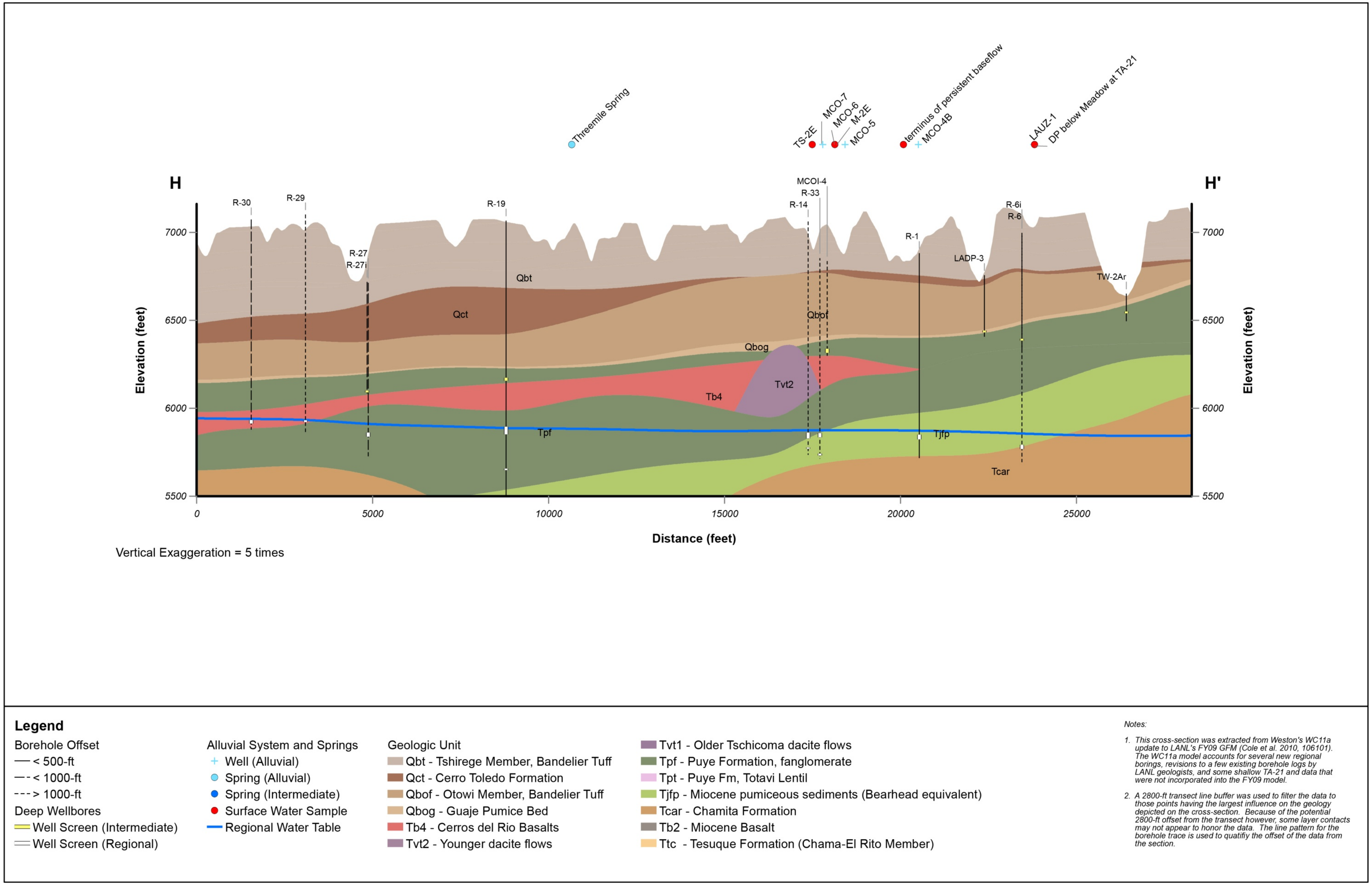
Geologic Unit
■ Qbt - Tshirege Member, Bandelier Tuff
■ Qct - Cerro Toledo Formation
■ Qbof - Otowi Member, Bandelier Tuff
■ Qbog - Guaje Pumice Bed
■ Tb4 - Cerros del Rio Basalts
■ Tvt2 - Younger dacite flows

■ Tvt1 - Older Tschicoma dacite flows
■ Tpf - Puye Formation, fanglomerate
■ Tpt - Puye Fm, Totavi Lentil
■ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
■ Tcar - Chamita Formation
■ Tb2 - Miocene Basalt
■ Ttc - Tesuque Formation (Chama-El Rito Member)

Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

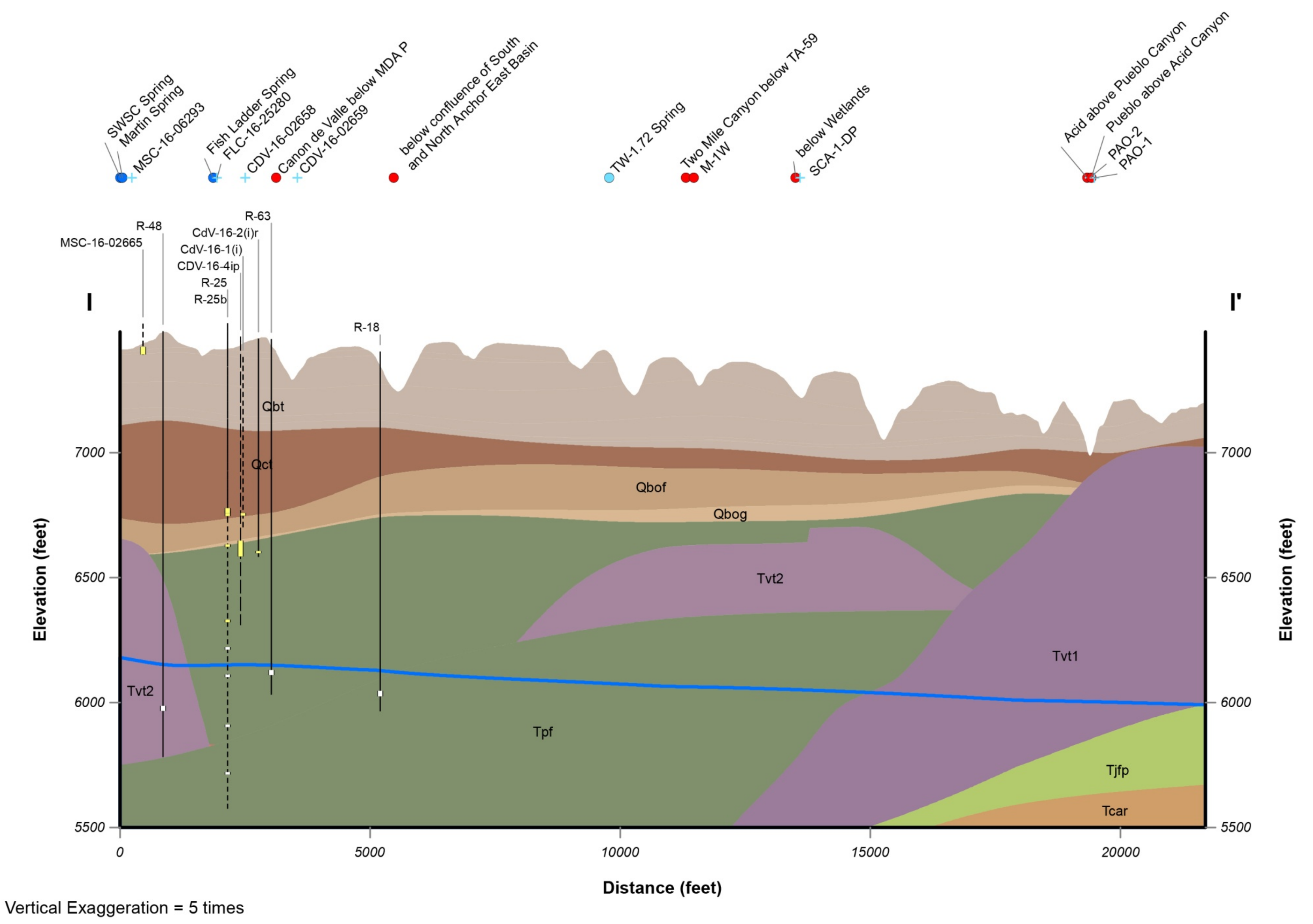
Figure G-8 Cross-section G–G′ in the eastern part of the Laboratory (north-south)



Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 2800-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 2800-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

Figure G-9 Cross-section H–H′ in the central part of the Laboratory (north-south)



Legend

Borehole Offset
— < 500-ft
— - < 1000-ft
- - - > 1000-ft
Deep Wellbores
▭ Well Screen (Intermediate)
▭ Well Screen (Regional)

Alluvial System and Springs
+ Well (Alluvial)
○ Spring (Alluvial)
● Spring (Intermediate)
● Surface Water Sample
— Regional Water Table

Geologic Unit
▆ Qbt - Tshirege Member, Bandelier Tuff
▆ Qct - Cerro Toledo Formation
▆ Qbof - Otowi Member, Bandelier Tuff
▆ Qbog - Guaje Pumice Bed
▆ Tb4 - Cerros del Rio Basalts
▆ Tvt2 - Younger dacite flows
▆ Tvt1 - Older Tschicoma dacite flows
▆ Tpf - Puye Formation, fanglomerate
▆ Tpt - Puye Fm, Totavi Lentil
▆ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
▆ Tcar - Chamita Formation
▆ Tb2 - Miocene Basalt
▆ Ttc - Tesuque Formation (Chama-El Rito Member)

Notes:

1. *This cross-section was extracted from Weston's WC11a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC11a model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 and data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quatifiy the offset of the data from the section.*

Figure G-10 Cross-section I–I′ in the western part of the Laboratory (north-south)