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Date: APR 17 2014
Symbol: ENV-DO-14-0091
LAUR: 14-22500

Mr. John E. Kieling
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Dear Mr. Kieling:

Subject: **Technical Area 63 Transuranic Waste Facility Soil Vapor Monitoring Work Plan, Los Alamos National Laboratory, EPA ID No. NM0890010515**

The purpose of this submittal is to provide a soil vapor monitoring work plan to the New Mexico Environment Department – Hazardous Waste Bureau (NMED-HWB). The work plan is required by new Permit Section 3.14.3 of the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit (Permit) issued to the National Nuclear Security Administration (NNSA) and Los Alamos National Security, LLC (LANS), (collectively the Permittees). The Permit section and requirement was included in new permit conditions associated with the Technical Area (TA)-63 Transuranic Waste Facility (TWF) which were approved by the NMED-HWB on December 23, 2013.

This work plan describes activities needed to install new vapor-monitoring wells and vapor sampling systems during construction of the TA-63 TWF. The work plan includes a description and basis for the design and technical details of the soil vapor monitoring program that will be implemented by the Permittees to meet the Permit conditions. It includes a text discussion for the soil vapor monitoring work plan with a conceptual site model, the monitoring approach, well construction specifications, and sampling requirements. These have been prepared incorporating guidance from the U.S. Environmental Protection Agency as referenced in the Permit and are similar to previous work plans submitted to the NMED-HWB by the LANL Corrective Action Program. This document also contains figures and references as needed to support the discussion.

If you have questions or comments concerning this submittal, please contact Gene E. Turner of the Department of Energy (DOE) at (505) 667-5794 or Mark P. Haagenstad (LANS) at (505) 665-2014.

Sincerely,

A R Grieggs

Anthony R. Grieggs
Group Leader
Environmental Compliance Programs (ENV-CP)
Los Alamos National Security LLC

Sincerely,

Pete Maggiore for

Gene E. Turner
Environmental Permitting Manager
Environmental Projects Office
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U.S. Department of Energy

ARG:GET:MPH:GAB/lm

Enclosures: (1) TA-63 Transuranic Waste Facility Soil Vapor Monitoring Work Plan, Los Alamos National Laboratory

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NMED
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Document: LANL TA-63 TWF SVM Work Plan
Date: April, 2014

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A R Grieggs

4/15/14

Anthony R. Grieggs
Group Leader
Environmental Compliance Programs
Los Alamos National Laboratory

Date Signed

Peter Maggiore for

4/17/14

Gene E. Turner
Los Alamos Field Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

Date Signed

ENCLOSURE 1

TA-63 Transuranic Waste Facility Soil
Vapor Monitoring Work Plan

ENV-DO-14-0091

LAUR-14-22500

U1400586

Date: APR 17 2014

TA-63 TRANSURANIC WASTE FACILITY SOIL VAPOR MONITORING WORK PLAN LOS ALAMOS NATIONAL LABORATORY

I. Introduction

This document provides a soil vapor monitoring work plan for the Technical Area (TA)-63 Transuranic Waste Facility (TWF). Construction of the TWF was approved by the New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB) on December 23, 2013 (NMED, 2013). The approval resulted from completion of the NMED-HWB review of the TA-63 Permit Modification Request (PMR) originally submitted on August 18, 2011 (LANL, 2011c). This work plan was required by the approval.

The Los Alamos National Laboratory (LANL or the Laboratory) Hazardous Waste Facility Permit (Permit) is issued to the United States Department of Energy (DOE), the owner and co-operator of LANL, and Los Alamos National Security, LLC (LANS), co-operator of LANL (collectively described as the Permittees). The Permit contains conditions for hazardous waste management activities at LANL necessary to protect human health and the environment. These include requirements for monitoring subsurface vapors to prevent worker exposure to potentially harmful levels of volatile organic compounds (VOCs) at the TWF. These requirements are contained in new Permit Section 3.14.3 and Attachment A.6.10, which were included in the approval by the NMED-HWB.

This work plan includes a description and basis for the design and technical details of the soil vapor monitoring program that will be implemented by the Permittees to meet those Permit conditions. It includes a discussion for the soil vapor monitoring work plan with a conceptual site model, monitoring approach, well construction specifications, and sampling requirements. These have been prepared incorporating guidance from the U.S. Environmental Protection Agency (EPA) as referenced in the Permit and are similar to previous work plans submitted to the NMED-HWB by the LANL Corrective Actions Program (CAP). This document also contains figures and references as needed to support the discussions.

II. Soil Vapor Monitoring Well Network

A. Purpose of Work Plan

This work plan describes activities needed to install new vapor-monitoring wells and vapor sampling systems during construction of the new TA-63 TWF. They will be used for site evaluation and to determine worker safety for potential soil vapor intrusion into the working spaces of the site's hazardous waste storage buildings. The NMED-HWB added new requirements to the Permit including the installation of a total of five new vapor-monitoring wells, sampling requirements, required methodology to determine soil gas screening levels (SGSL), and additional actions to be taken if constituents in the vapor-monitoring wells are detected that exceed screening levels (Permit Section 3.14.3). This work plan addresses the technical issues for the installation of the new vapor monitoring wells and sampling

requirements. Additional actions to be taken if the screening levels are exceeded are detailed in the Permit.

B. Conceptual Site Model

The conceptual site model (CSM) considers the source of contaminants, release mechanisms, transport mechanisms, and potential receptors at a site where the possibility of contamination with VOCs exists from nearby sources. Understanding these CSM components is necessary to develop an appropriate soil vapor monitoring network and interpret sampling results at a potential soil vapor intrusion site. The CSM for the TA-63 TWF evaluates the potential that soil vapor releases from nearby sources are migrating towards TWF through the subsurface and have the potential to diffuse into the TWF storage buildings and affect indoor air breathed by site workers. The NMED-HWB requirements for the soil vapor monitoring network at the new TWF have already been specified in the Permit, but the following summary of the site and the basis for the soil vapor monitoring is presented for information and to aid in review of this work plan.

The TWF will be constructed at a location south and east of the TA-50 Material Disposal Area C, Solid Waste Management Unit 50-009, (MDA-C) at LANL. MDA-C is the site of past waste disposal activities. MDA-C is under investigation and potential remediation by the LANL CAP subject to the Compliance Order on Consent issued by the New Mexico Environment Department on March 1, 2005.

MDA-C is the primary source near the TWF for potential soil vapor intrusion. MDA-C is an inactive 11.8-acre landfill consisting of waste disposal pits and shafts (see Figures 1 and 2). Solid low-level radioactive wastes and chemical wastes were disposed in the landfill mainly between 1948 and 1968, followed by intermittent activities until it was decommissioned in 1974. Wastes disposed at MDA-C consisted of liquids, solids, and containerized gases generated from a broad range of nuclear research and development activities conducted at the Laboratory. The waste included uncontaminated classified materials, metals, hazardous materials, and radioactively contaminated materials (LANL, 2011b). The depths of the pits and shafts at MDA-C range from 10 to 25 feet (ft) below the original ground surface. After the end of disposal activities, the pits and shafts were covered with varying amounts of fill material. The topography of the surface above MDA-C is relatively flat, although the slope steepens to the north and there are canyons north and south of the site. The regional aquifer is estimated to be approximately 1330 feet below the ground surface (bgs).

The source of soil vapor in pore gas at MDA-C is VOC contamination from the wastes disposed at the site as determined by CAP studies. The mechanism for release and transport of VOCs from the source is vapor diffusion through the surrounding media. VOC vapors will diffuse from areas of high concentration (i.e., near the source) to areas of low concentration (e.g., the ground surface, canyon walls, and uncontaminated pore gas at depth). This appears to be the main factor determining the distribution of VOC soil gas vapors from MDA-C.

The transport of soil vapors may also be affected by several other factors. The spatial distribution of VOC contamination is also affected by the properties of the geologic units. The pits and shafts are constructed in Unit Qbt 3 of the Tshirege Member of the Bandelier Tuff geological unit at

LANL. Qbt 3 is approximately 100 ft thick at MDA-C (i.e., deeper than any of the required soil vapor monitoring network wells) and is a partly welded devitrified ash-flow tuff that forms the mesa caprock at MDA-C. Soil vapor transport through the upper tuff units of the Tshirege Member of the Bandelier Tuff is a function of the permeability of the tuff and may be enhanced by the presence of fractures or other preferential vapor pathways such as utility corridors. Transport can also be influenced by bulk movement of air through the tuff caused by changes in atmospheric pressure that could result in dilution of pore gas near the surface or near fractures and in variability of the VOC concentrations in pore gas over time. The spatial distribution of VOC contamination resulting from diffusive transport is also affected by the age of the release. Ongoing releases should exhibit highest concentrations near the source area (i.e., near the shafts), with concentrations decreasing with distance away from the shafts. Older releases may be characterized by concentrations that are higher at depth than near the source, indicating the release is not ongoing.

LANL has developed several reports and collected on-going data by sampling the soil vapor at MDA-C to provide information on the characteristics of the soil vapor plume and evaluate the CSM factors. On July 15, 2011, the *Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009 at Technical Area 50* (LANL, 2011b) was submitted by LANL to the NMED and subsequently approved by the NMED on December 8, 2011. The report discussed the sampling performed to define the horizontal and vertical extent of the vapor plume made up of VOCs beneath MDA-C. In particular, the concentration data for the most prevalent VOC, trichloroethylene (TCE), was modeled to illustrate the shape and extent of the vapor plume.

A total of 28 VOCs were detected in samples from the most recent sampling event reported in the Phase III Investigation Report (IR). The mean subsurface vapor concentrations of all the constituents in the plume were compared to the time-weighted threshold limit values (TLVs) defined by the American Conference of Governmental Industrial Hygienists (ACGIH) and only TCE exceeded its TLV. Based on two years of averaged quarterly vapor monitoring, TCE concentrations at MDA-C exceeded the TLV at depths of 200 to 300 ft bgs, with a maximum of 118% of the TLV. However, TCE concentrations have been determined to be significantly lower than the TLV at the ground surface and at 20 ft below the surface. Vapors appear to be transported by diffusion radially outward from the center of the MDA-C soil vapor plume, resulting in concentration gradients with concentrations decreasing with distance from the center of the plume. As the TLVs are only exceeded at the source location of the plume, the likelihood of those concentrations being exceeded further from the source and closer to the surface are decreased with diffusive transport.

The Phase III model indicated that the boundary of the soil vapor plume extended to a position under the northwest section of the proposed TWF site. LANL also presented the results of this evaluation in a supplementary report describing the nature and extent of the MDA-C vapor plume situated near the proposed TWF waste management site. This supplementary report was included as Attachment D of the *Response to Notice of Deficiency Administrative Completeness and Fee Assessment, TA-63 Transuranic Waste Facility Permit Modification Request* of April 16, 2012 (LANL, 2012a). The report was titled "*The Vapor Plume at Material Disposal Area C in Relation to Pajarito Corridor Facilities*." The report used a series of maps and cross sections

(see Figures 3 and 4) illustrating the modeled concentrations of TCE to address concerns about the proximity of the vapor plume at MDA-C that were raised for the TWF PMR in a public information meeting on August 10, 2012. The report concluded that sampling and data interpretation indicate that the vapor plume does not pose a threat to the health of LANL workers nor will it pose a threat to workers during construction of the proposed facilities.

After the submittal of the Phase III IR, LANL conducted 4 additional vapor monitoring events at MDA-C. Results from the first of these events, conducted in March and April 2012, were included in the Corrective Measures Evaluation report for MDA-C, submitted to the NMED on September 28, 2012 (LANL, 2012c). These results showed that concentrations had generally decreased since the original sampling event. In the past 4 vapor monitoring events, TCE was the only VOC detected at concentrations exceeding TLVs. TCE was detected above its TLV in 1 to 3 samples during each event. All samples above TLVs were collected at depths of 241 to 288 ft bgs from locations within the central part of the plume. The maximum detected concentration was 1.6 times the TLV. These results indicate that the originally modelled soil vapor concentrations and the modelled extent of the plume are relatively stable. They also continue to support the model for the CSM in that the main factor affecting the distribution of the plume is diffusive transport of soil vapor from the central source with a decreasing gradient to the edges of the plume.

On May 24, 2012, the NMED-HWB issued a Disapproval letter (NMED, 2012e) for the TWF PMR that included comments regarding the MDA-C plume. In the letter, the NMED-HWB required LANL to "propose the installation of a monitoring network capable of detecting contaminant migration toward the TWF from the MDA-C vapor plume in order to prevent completion of exposure pathways to the TWF structures or other potential receptor locations..."

LANL included a proposal for a soil vapor monitoring well network in the response to the Disapproval letter (LANL, 2012b). LANL's proposal was to place soil vapor monitoring wells to provide additional information regarding the constituent VOC concentrations based on the concentration gradient indicated by the CSM, i.e., diffusive transport from the VOC source with VOC concentrations decreasing with increasing distance.

In subsequent discussions between the NMED-HWB and the Permittees, the design of the network was further developed resulting in the specific conditions contained in the Permit. The approved Permit requires that the Permittees monitor subsurface vapors to evaluate for potential future vapor intrusions into the TWF storage buildings resulting from releases from MDA-C and contains criteria for detection and subsequent actions, if necessary, to protect human health (Permit Section 3.14.3). The Permit requirements referred to the EPA's "User's Guide to Evaluating Subsurface Vapor Intrusion Into Buildings" (USEPA, 2004).

C. Proposed Monitoring Approach

The Permittees will install a subsurface vapor monitoring network consisting of five vapor monitoring wells in or near the TWF facility, as specified in Permit Section A.6.10. Two of the monitoring wells will be located as close as possible to the building foundations that are adjacent to the unit boundary facing MDA-C and the utility corridor on Puye Road as depicted by

locations VMW-1 and VMW-2 in Figure 5 of this work plan (Figure 56 in Attachment N, *Figures*, of the Permit). A third monitoring well will be located at a point on the western edge of the permitted unit as close as possible to the utility corridor on Pajarito Road, as depicted by location VMW-3 on Figure 5. Two monitoring wells will be located between MDA-C and Puye Road, as depicted by locations VMW-4 and VMW-5 on Figure 5.

Each soil vapor monitoring well will be positioned within a 10-foot radius of its corresponding location as shown in Figure 5. This flexibility is needed in order to adjust for potential factors such as minor changes in building designs, construction requirements such as foundation supports, or siting restrictions. In all cases, the final location of each well will meet the intent of the associated Permit condition and the EPA guidance.

Further analysis of the suitability of the well locations will be evaluated using the EPA guidance as the planning stage for the project advances. LANL is also continuing scheduled sampling for soil vapor concentrations as part of the corrective actions associated with MDA-C. It is possible that these activities could demonstrate that data from the VMW-4 and VMW-5 wells would have a minimal relationship to evaluate worker safety at the TWF due to their distance from the storage facility or for other reasons. Should this prove to be the case, LANL may submit a PMR to NMED-HWB to remove them from the Permit. However, until that decision point, design and construction planning for all five wells will continue forward as part of the current project plan as detailed above.

D. Well Design

As specified in the Permit, vapor monitoring wells VMW-1, VMW-2, and VMW-3 will be constructed with a single vapor monitoring port located in the center of a sampling interval between 5 ft and 10 ft bgs. Vapor monitoring wells VMW-4 and VMW-5 will be constructed with two vapor monitoring ports located at 25 ft and 60 ft bgs. Boreholes will be advanced using hollow stem auger drilling methods. The vapor monitoring wells will be constructed utilizing the same type of stainless steel tubing sampling system used at Vapor Monitoring Well 50-613183 at MDA-C, i.e., a 0.25-in. x 12-in long cylindrical stainless steel screen in filter-pack sand connected to 0.25-in. stainless steel tubing.

Well boreholes for VMW-1, VMW-2, and VMW-3 will be advanced to the design total depth of 15 ft bgs. A surface casing will be installed and cemented in place. A layer of bentonite will be placed at the bottom of the borehole and hydrated for a minimum of 1 hour. A continuous 0.25 inch stainless steel sampling tube with a screened end opening will then be placed in the borehole centered in the sampling interval (5 ft to 10 ft bgs) depth and clean sand filter pack added as the auger(s) are withdrawn to create a vapor permeable medium in the interval 5 ft to 10 ft bgs. The vapor monitoring wells will then be sealed by placing 2.5 ft of bentonite hydrated for a minimum of 1 hour and then overlain by approximately 2 ft of bentonite-cement grout (see Figure 6).

Well boreholes for VMW-4 and VMW-5 will be advanced to the design depth of 67.5 ft bgs. A surface casing will be installed and cemented in place. A layer of bentonite will be placed at the bottom of the borehole and hydrated for a minimum of 1 hour. A continuous 0.25 inch stainless

steel sampling tube with a screened end opening will be placed in the borehole centered in the 5-foot sampling intervals and clean sand filter pack added as the auger(s) are withdrawn to create a vapor permeable medium in the intervals from 57.5 ft to 62.5 ft bgs and 22.5 ft to 27.5 ft bgs. A minimum 5 ft hydrated bentonite clay plug will be placed above and below each sampling interval. Bentonite chips will fill the borehole between the hydrated bentonite plugs for the sampling intervals and from the top of the 25 ft sampling interval to 5.5 ft bgs. This will be overlain by a 5 ft bentonite cement grout surface seal (see Figure 7).

Monitoring well surface completions consisting of traffic-rated, flush-mount steel surface monuments will be installed. The Permittees will take measures to ensure that the surface monuments will be protected from damage by snow removal or other maintenance equipment by the use of traffic bollards. Any well surface seals will be allowed to cure for at least 24 hours before collecting vapor samples.

The installation procedures for the vapor-monitoring well construction will consist of the following steps:

1. Measure and record the total depth of the borehole after drilling to the target depth.

2. Add 5 ft of bentonite layer. Add water periodically to hydrate the pellets as they are being emplaced. Allow the hydrated layer to stabilize for one hour or longer.

3. Add approximately 2.5 ft of 10/20 silica sand to support the stainless-steel screen and measure and record the depth.

4. Lower the sampling screen and enough stainless-steel tubing to reach top of silica sand and measure and record the depth.

5. Add another 2.5 ft of 10/20 silica sand and measure and record the depth. The maximum silica sand interval is approximately 5 ft.

6. Add enough bentonite pellets to reach the bottom of the next screen location or ground surface of the borehole as appropriate and measure and record the depth. Add water periodically to hydrate the pellets as they are being emplaced.

7. Repeat steps 3-6 for Wells VMW-4 and VMW-5.

8. Label the top of each stainless-steel tube to identify each screen and the depth of the screen and install a cap over the end of the tube.

9. Install surface completion.

E. Drilling and Well Construction Methods

The soil vapor monitoring wells will be drilled using a hollow-stem auger drill rig.

Procedures used will be from the most current version of LANL EP-DIR-SOP-10001, "Installation of Vadose Zone Monitoring Wells for Vapor Sampling and Moisture Monitoring," (LANL, 2010). The boreholes will be logged during drilling by the on-site geologist. Borehole logging will be performed in accordance with the current version of LANL SOP-12.01, "Field Logging, Handling, and Documentation of Borehole Materials," (LANL, 2001).

Well construction will initially be done with the augers in place in the borehole. The sampling screens and tubes will be emplaced through the auger stem, and the augers will be slowly withdrawn as backfill material (sand or bentonite) is added. This approach will be used to prevent slough from entering the borehole. After the sampling tubes have been installed, the augers will be completely withdrawn from the borehole to provide more room for installation of the remaining materials.

F. Post Installation Vapor Sampling

Sampling procedures and VOC analyses of the obtained samples will be performed and scheduled in compliance with the conditions contained in the Permit. Sample results will be compared to the SGSLs, and subsequent actions will be determined as appropriate.

Before samples are collected, the screened interval and sample collection system will be purged in accordance with LANL procedure EP-ERSS-SOP-5074, "Sampling Subsurface Vapor" (LANL, 2012d). During the purge, measurements of percent oxygen, percent carbon dioxide, and percent methane will be collected from the sample train exhaust every several minutes to ensure that all ambient air is evacuated from the system. Static subsurface pressure will also be measured. Once these gas concentrations are stable, vapor sampling will proceed. Initial vapor-monitoring samples will be collected within 30 days of completion of each vapor monitoring well.

The sampling of the new vapor-monitoring wells will be coordinated with and performed using the same procedures as the ongoing vapor monitoring conducted at MDA-C. Sampling will be performed by extracting formation air through the sand layer and into the SS tubing. Samples will be collected from all sampling ports according to the most current version of LANL procedure EP-ERSS-SOP-5074, "Sampling Subsurface Vapor." All samples for VOC analysis will be collected in SUMMA canisters and submitted for laboratory analysis of VOCs using EPA Method TO-15 (USEPA, 1999). The samples will be analyzed, at a minimum, for the constituents identified in Tables 3.14.3.1, 3.14.3.2 and 3.14.3.3 in Permit Section 3.14.3.

Analysis and data validation of samples will be performed subject to EPA Method TO-15 and the most current version of LANL SOP-5161, "Waste and Environmental Services Standard Operation Procedure for Routine Validation of Volatile Organic Compound (VOC) Analytical Data" (LANL, 2008).

Vapor monitoring well construction will be completed and at least one vapor sample collected from each well sampling port prior to the start of operations at the TWF. Vapor samples must then be collected quarterly during the first year of operation. After the first year of sampling, the Permittees may propose an alternate sampling frequency for subsequent years in a permit

modification request. This will be based on the evaluation of data from the pre-operational and quarterly samples, as well as relevant vapor monitoring data collected from nearby vapor monitoring locations.

G. Reporting

The Permittees will submit a letter report no later than 60 days following each sample collection event detailing the sampling procedure, analytical results, and any deviations from the monitoring work plan as required by Permit Section 3.14.3.

H. Investigation Derived Waste Management

Investigation-derived waste (IDW) will be managed in accordance with LANL EP-DIR-SOP-10021, "Characterization and Management of Environmental Program Waste" (LANL, 2012e). This procedure incorporates the requirements of all applicable EPA and NMED regulations, U.S. Department of Energy orders, and Laboratory requirements. The primary waste streams include drill cuttings, contact waste, and, potentially, decontamination water. Drill cuttings will be managed in accordance with the NMED-approved *Notice of Intent Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes* (November 2007). Drill cuttings will be containerized and characterized with direct sampling. If they cannot be land-applied, the cuttings will be sent to an authorized treatment, storage, or disposal facility. Contact waste will be containerized and characterized based on the waste determination of the drill cuttings. If decontamination water is generated, it will be containerized and characterized by direct sampling of the containerized waste.

I. Schedule

Subject to TWF project funding, construction scheduling needs, and uncontrolled events, drilling, and installation of the vapor-monitoring wells are planned to be started during the construction phase of the TWF, which is currently scheduled to begin in June, 2014. The three on-site wells are preliminarily scheduled to be installed in the Summer of 2014 prior to the beginning of major construction at the TWF (e.g., storage building foundations and concrete pad) to simplify installation. The schedule for the two off-site wells is not as affected by the immediate TWF site construction and their installation may occur later. Initial sampling from the wells will occur prior to the start of operations at the TWF currently scheduled for the Fall of 2015. Vapor samples will then be collected quarterly during the first year of operation. The Permittees will submit a letter report no later than 60 days following each sample collection event.

As described in Permit Section 3.14.3, after the first year of sampling, the Permittees may propose an alternate sampling frequency for subsequent years, in a PMR submitted to the NMED-HWB, based on the evaluation of data from the pre-operational and quarterly samples, as well as relevant vapor monitoring data collected from nearby vapor monitoring locations.

J. Quality Assurance

Quality assurance activities for the soil vapor monitoring well network will be performed using the same procedures as the ongoing vapor monitoring conducted at MDA-C. Samples will be collected from all sampling ports according to the most current version of LANL procedure EP-ERSS-SOP-5074, "Sampling Subsurface Vapor."

Quality assurance procedures for the analyses and validation of data for the collected samples will be managed with EPA Method TO-15 and the most current version of LANL SOP-5161, “Waste and Environmental Services Standard Operation Procedure for Routine Validation of Volatile Organic Compound (VOC) Analytical Data” (LANL, 2008).

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Acronyms

Los Alamos National Laboratory	LANL
Transuranic Waste Facility	TWF
New Mexico Environment Department – Hazardous Waste Bureau	NMED-HWB
Department of Energy	DOE
Los Alamos National Security	LANS
Material Disposal Area	MDA
Technical Area	TA
Resource Conservation and Recovery Act	RCRA
Code of Federal Regulations	CFR
Volatile organic compounds	VOC
Corrective Actions Program	CAP
Investigation Report	IR
Conceptual site model	CSM
Trichloroethylene	TCE
Threshold limit values	TLV
American Conference of Governmental Industrial Hygienists	ACGIH
Soil gas screening levels	SGSL
U.S. Environmental Protection Agency	EPA
Indoor Air Screening Levels	IARL
Permit Modification Request	PMR
Investigation-derived waste	IDW
Environmental Programs-Environment and Remediation Support Services Division	EP-ERSS
Foot or feet	ft
Below ground surface	bgs

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Figures

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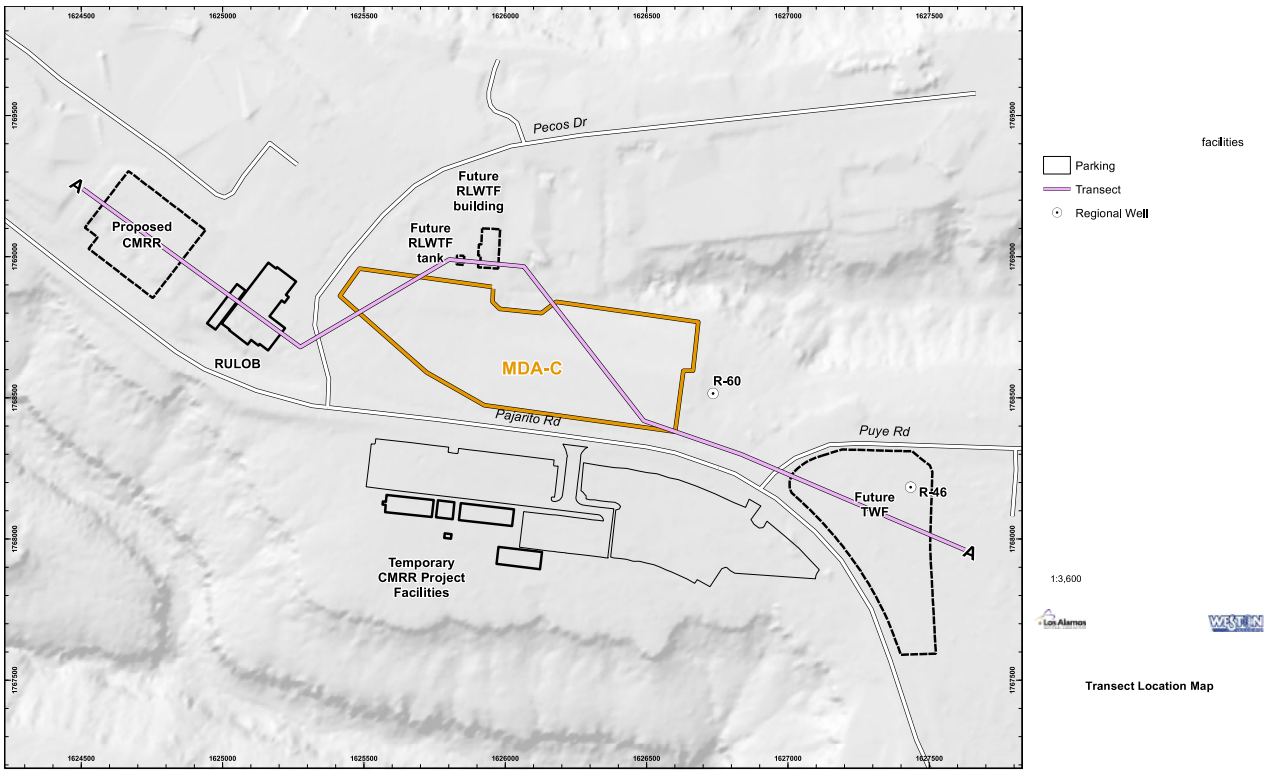

Figure 1

Location of MDA-C and TWF

(Source: *Response to Notice of Deficiency Administrative Completeness and Fee Assessment TA-63 Transuranic Waste Facility Permit Modification Request Los Alamos National Laboratory*, LA-UR-12-20478, April 16, 2012, Los Alamos National Laboratory, Los Alamos, New Mexico.)

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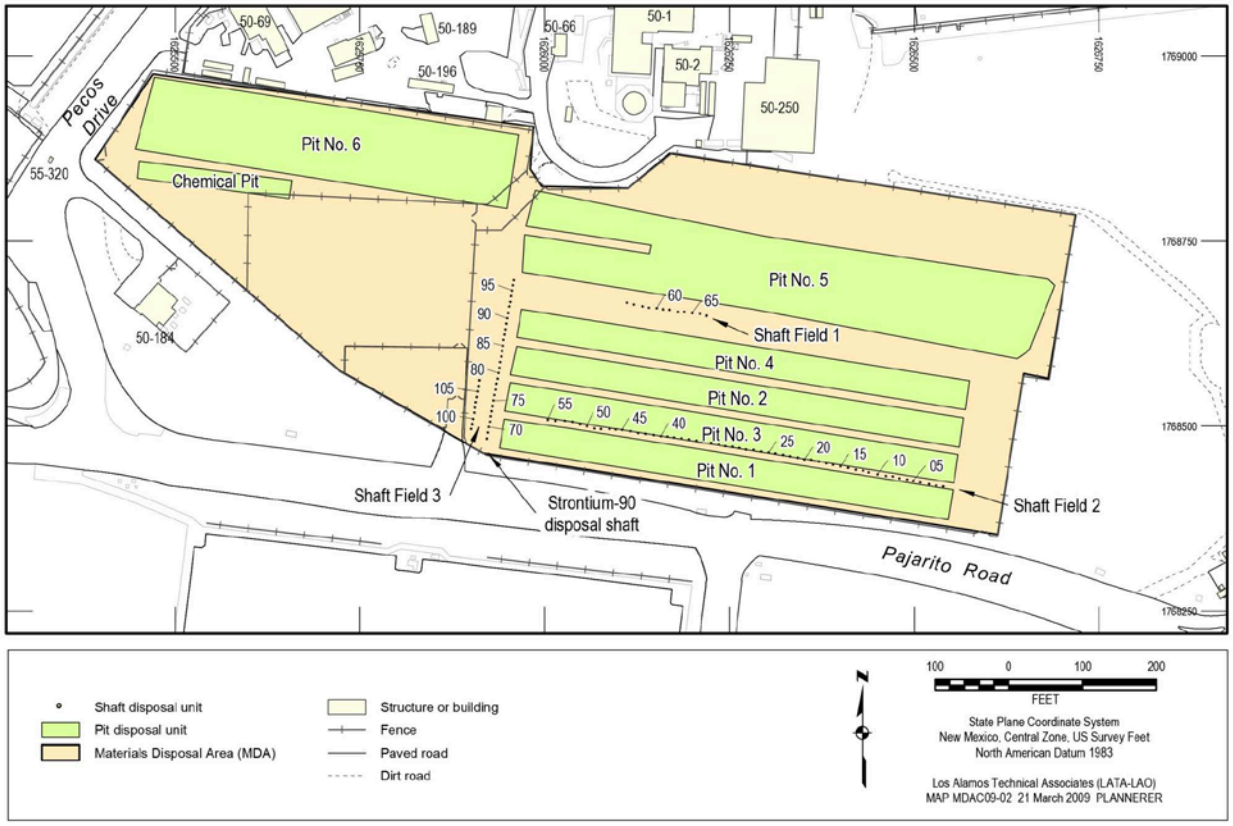

Figure 2

MDA-C Details

(Source: *Corrective Measures Evaluation Report for Material Disposal Area C, Solid Waste Management Unit 50-009 at Technical Area 50*, LA-UR-12-24944, EP2012-0194, September 2012, Los Alamos National Laboratory, Los Alamos, New Mexico)

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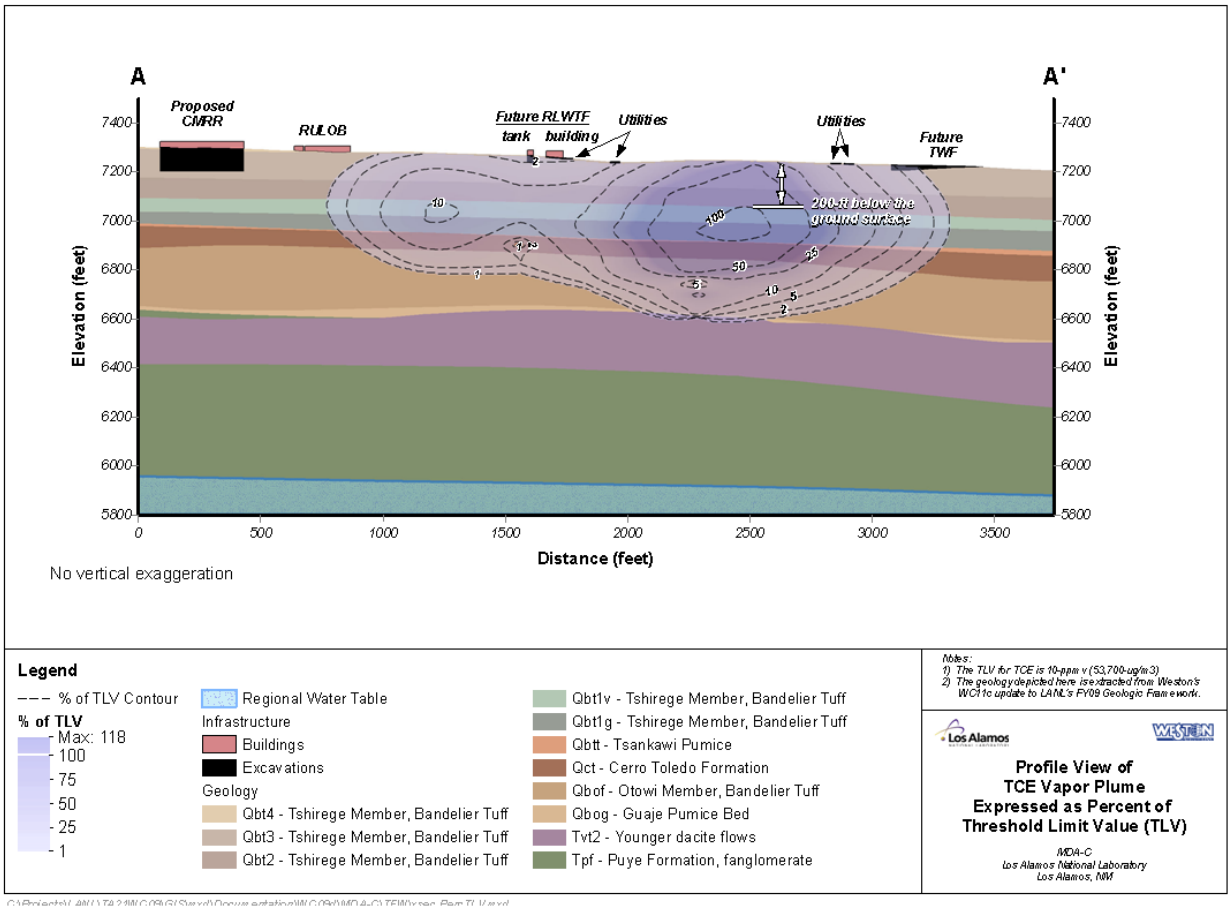

Profile view of the TCE vapor plume expressed as percent of the Threshold Limit Value (TLV).

Figure 3

MDA-C Vapor Plume Model Results- Vertical View
(Transect of A-A', Figure 1)

(Source: *Response to Notice of Deficiency Administrative Completeness and Fee Assessment TA-63 Transuranic Waste Facility Permit Modification Request Los Alamos National Laboratory*, LA-UR-12-20478, April 16, 2012, Los Alamos National Laboratory, Los Alamos, New Mexico.)

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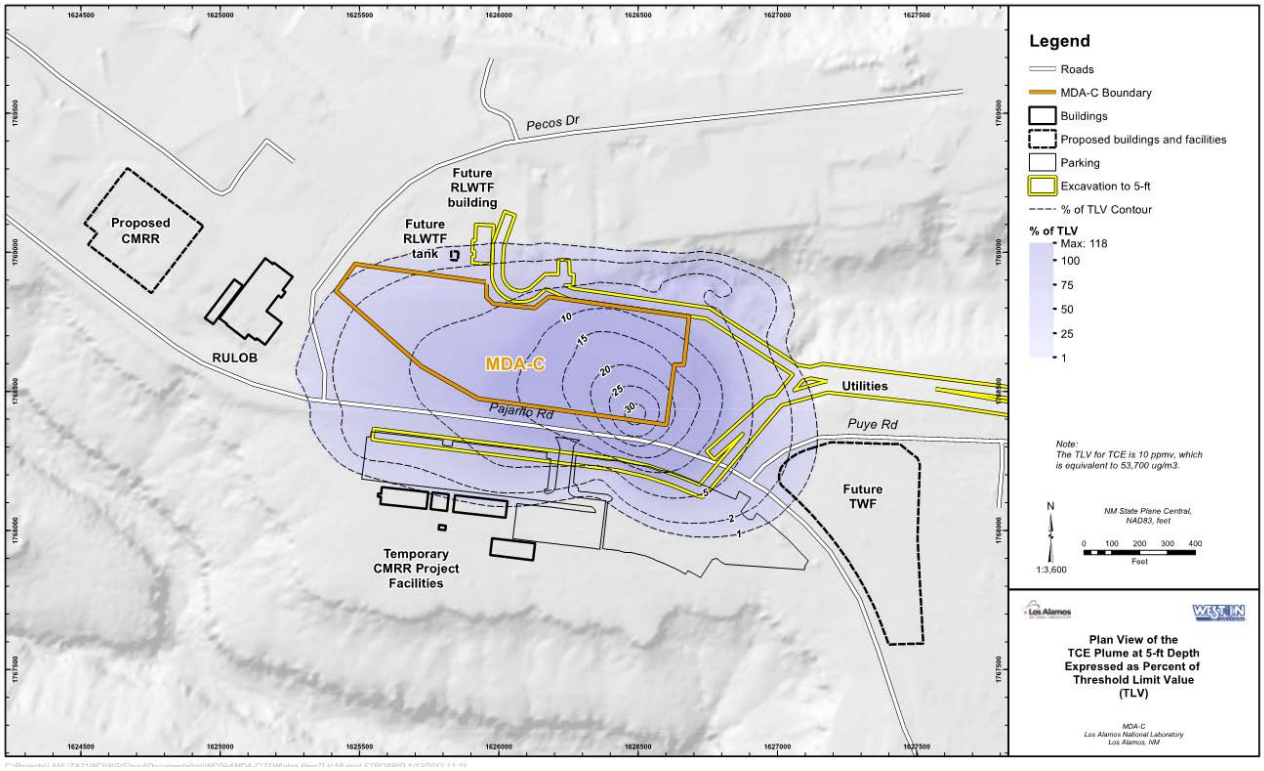

Figure 4

MDA-C Vapor Plume Model Results, Horizontal View

(Source: *Response to Notice of Deficiency Administrative Completeness and Fee Assessment TA-63 Transuranic Waste Facility Permit Modification Request Los Alamos National Laboratory*, LA-UR-12-20478, April 16, 2012, Los Alamos National Laboratory, Los Alamos, New Mexico)

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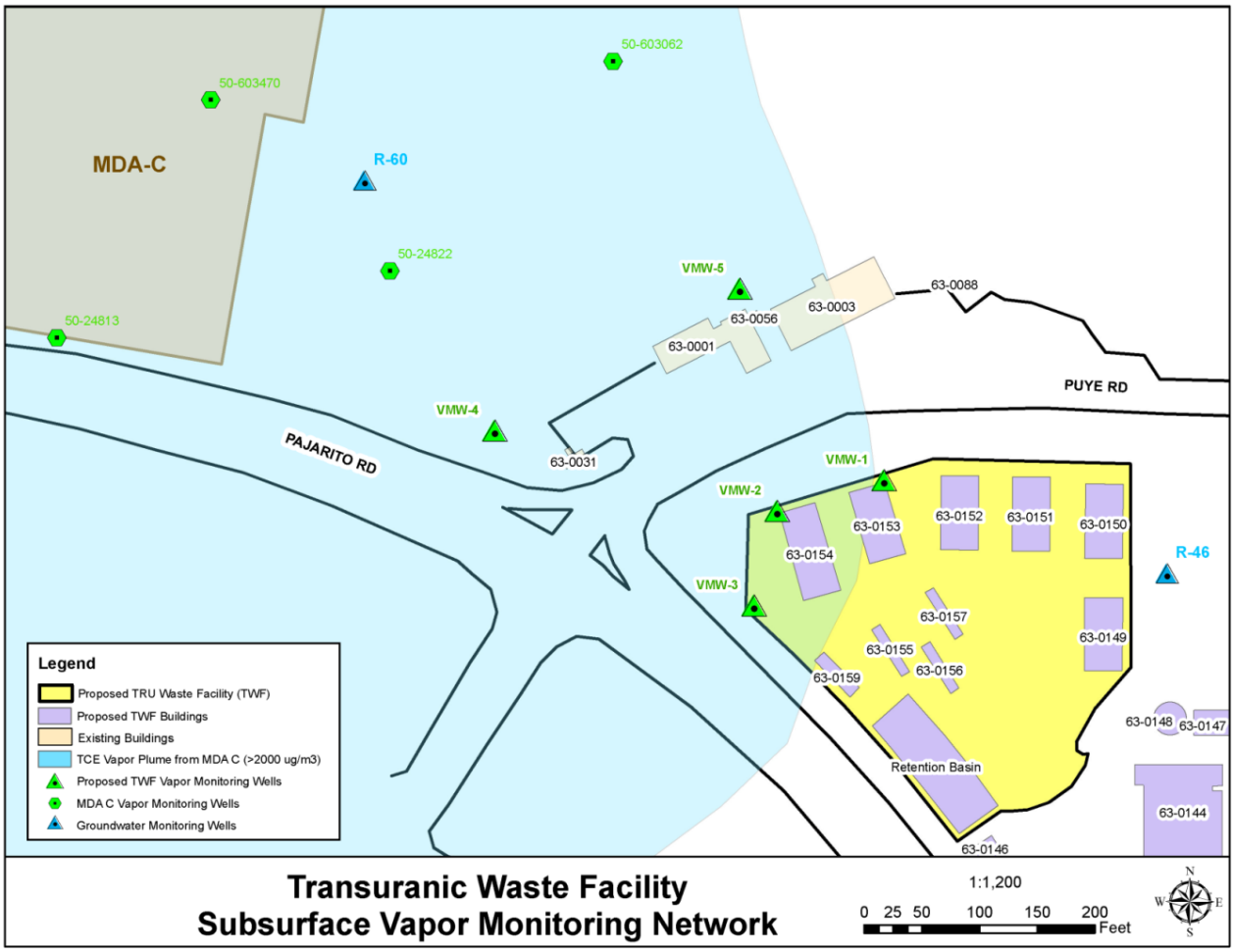

Figure 5

Soil Vapor Monitoring Well Locations at TA-63 TWF

(Source: Los Alamos National Laboratory Hazardous Waste Facility Permit, December, 2010, Figure 56 [Added December 2013])

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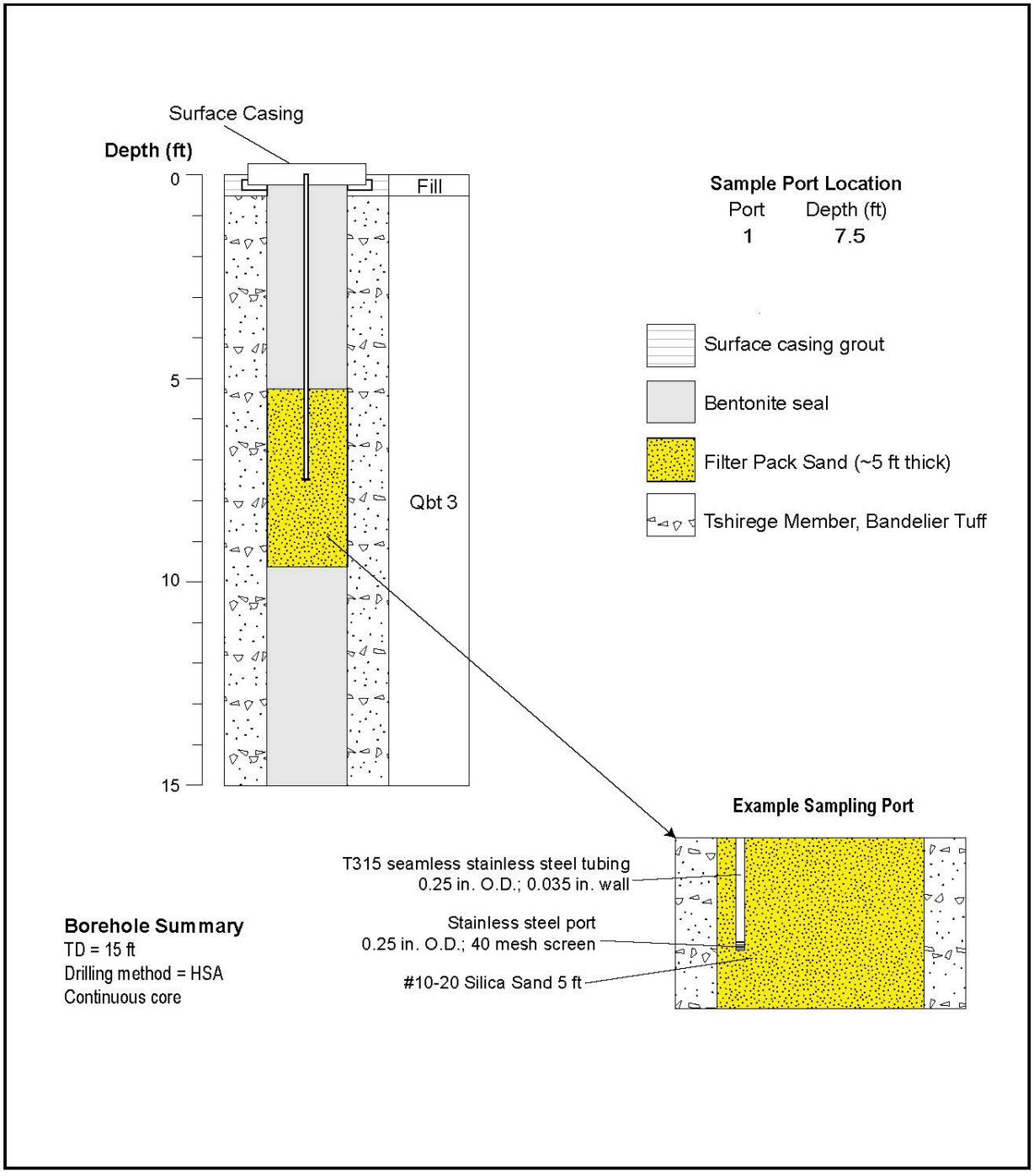

Figure 6

VMW-1, VMW-2, VMW-3 Well Design

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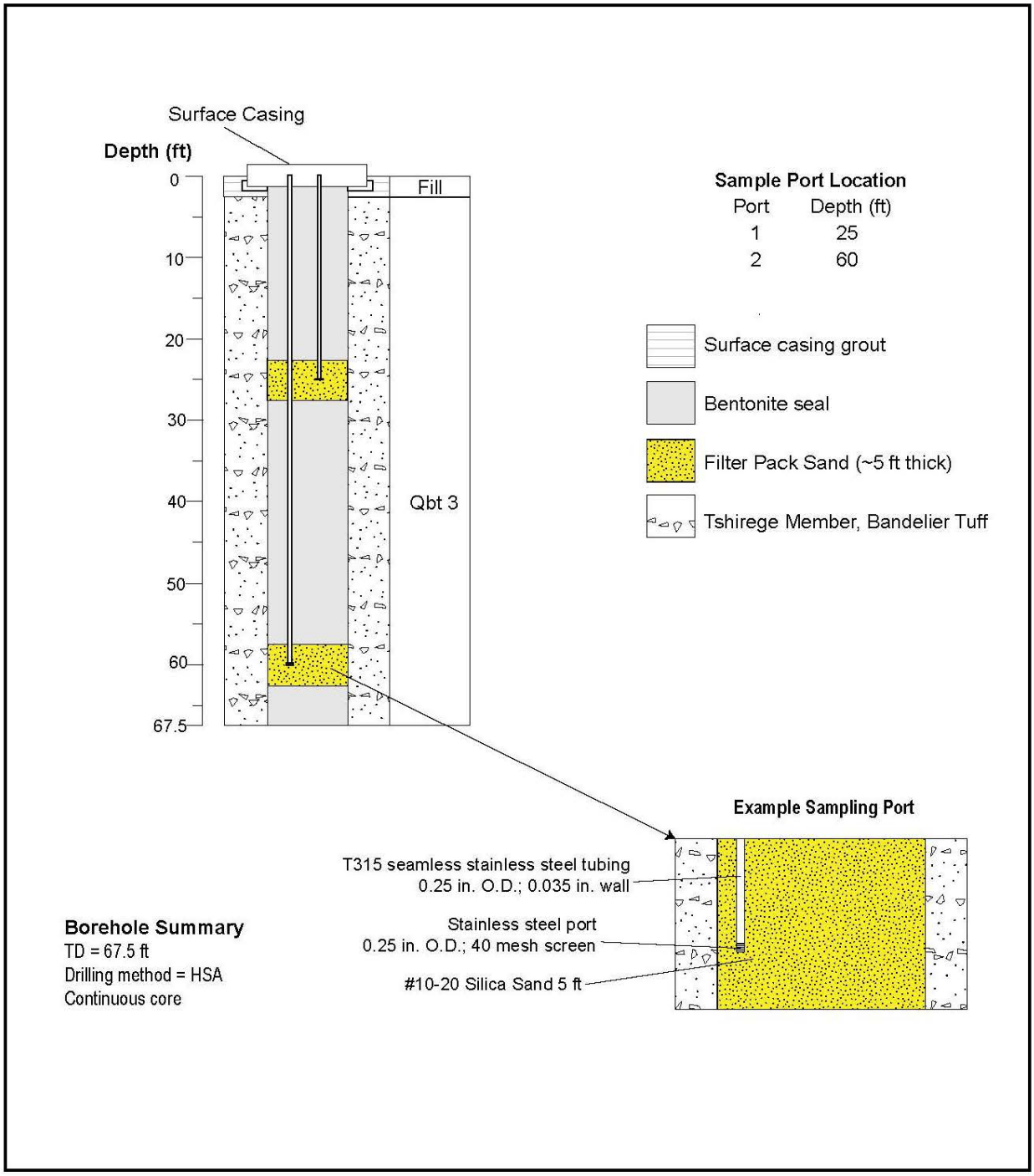

Figure 7

VMW-4, VMW-5 Well Design

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