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Department of Energy
National Nuclear Security Administration
Sandia Field Office
P. O. Box 5400
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Hazardous Waste Bureau

Mr. Dave Cobrain
Manager
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, NM 87505

Subject: Submittal of Investigation Report for Voluntary Corrective Action at Solid Waste Management Unit 502 Building 9938 Surface Discharge Site for Sandia National Laboratories/New Mexico, EPA ID NM5890110518

Dear Mr. Cobrain:

The Department of Energy (DOE) is submitting the enclosed Investigation Report for Voluntary Corrective Action (VCA) at Solid Waste Management Unit (SWMU) 502 Building 9938 Surface Discharge Site. The DOE and Sandia Corporation (Sandia) notified the New Mexico Environment Department (NMED) of the newly-identified or suspected Solid Waste Management Unit (SWMU) in a letter dated December 19, 2012. On February 12, 2013, the DOE and Sandia transmitted a SWMU Assessment Report (SAR) to the NMED by certified mail. Additional supplemental information summarizing analytical data from surface soil samples collected on January 16, 2013, was submitted to NMED on April 2, 2013. On April 3, 2013, the DOE and Sandia received approval from NMED regarding the SWMU SAR. On June 7, 2013, a VCA Plan was submitted to NMED.

The DOE and Sandia elected to conduct a VCA at SWMU 502 in accordance with Section VI.H of the Compliance Order on Consent (Order) between the DOE, Sandia, and the NMED. This Investigation Report was prepared in accordance with Section VI.H.3 and VI.H.4 of the Order and presents the results as required. Based upon field investigation results, soil sample analytical data, and the human health and ecological risk assessment analyses, a determination of corrective action complete without controls is recommended for SWMU 502.

If you have questions, please contact David Rast of my staff at (505) 845-5349.

Sincerely,

James W. Todd
Assistant Manager for Engineering

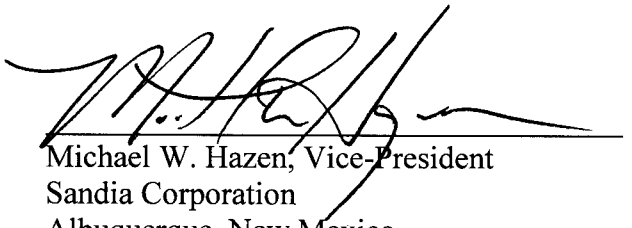
Enclosures
cc: See Page 2

Investigation Report for Voluntary Corrective Action at
Solid Waste Management Unit 502, Building 9938 Surface Discharge Site

Sandia National Laboratories
Albuquerque, New Mexico
EPA ID No. NM5890110518

CERTIFICATION STATEMENT

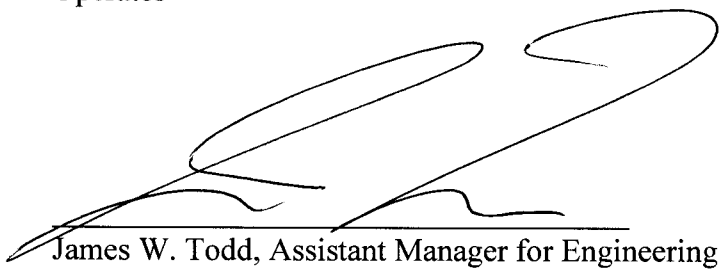
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, 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 or imprisonment for knowing violations.



29 Oct 2013

Michael W. Hazen, Vice-President
Sandia Corporation
Albuquerque, New Mexico
Operator

Date signed



08 Nov 2013

James W. Todd, Assistant Manager for Engineering
U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office
Owner

Date signed

Sandia National Laboratories

Sandia National Laboratories/New Mexico Long Term Stewardship

Investigation Report for Voluntary Corrective Action at Solid Waste Management Unit 502 Building 9938 Surface Discharge Site

October 2013

U.S. DEPARTMENT OF ENERGY

United States Department of Energy
Sandia Field Office

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

EXECUTIVE SUMMARY

The Department of Energy/National Nuclear Security Administration (DOE/NNSA) and Sandia Corporation (Sandia) conducted a voluntary corrective action (VCA) at the Solid Waste Management Unit (SWMU) 502, Building 9938 Discharge Site at Sandia National Laboratories, New Mexico (SNL/NM). The VCA was planned and conducted in accordance with Sections VI.H.3 and VI.H.4 of the Compliance Order on Consent (Order) between the DOE, Sandia, and the New Mexico Environment Department (NMED) (NMED, 2004).

The VCA at SWMU 502 addresses the remediation initiative, including surface soil sampling, subsurface soil sampling, complete site assessment, and determination of the final remediation alternative. Soil samples were analyzed for high explosive compounds, perchlorate, Target Analyte List metals, volatile organic compounds, semivolatile organic compounds, perchlorate, and nitrate plus nitrite. The soils sample results were compared to approved background concentrations for SNL/NM (Dinwiddie September 1997), soil screening levels presented in *New Mexico Environment Department Risk Assessment Guidance for Site Investigation and Remediation*, (NMED June 2012), the *Environmental Protection Agency (EPA) Regional Screening Levels, Region 6* (EPA May 2013), and the *EPA's Ecological Risk Assessment Guidance for Superfund* (EPA June 1997).

Based upon field investigation results, a determination of corrective action complete without controls is recommended for SWMU 502 with the following explanations:

- Constituents of concern (COCs) are not present in the soil at levels considered hazardous to human health for either an industrial or residential land-use scenario.
- COCs warrant no ecological concern because ecological risks were acceptable per NMED guidance.

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ACRONYMS AND ABBREVIATIONS

AOP	administrative operating procedure
bgs	below ground surface
CAC	corrective action complete
cm/yr	centimeter(s) per year
COC	constituents of concern
DOE	U.S. Department of Energy
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ft	feet
HE	high explosive
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
µg/kg	micrograms(s) per kilogram
mg/kg	milligrams(s) per kilogram
MDL	method detection limit
NPN	nitrate plus nitrite
NMED	New Mexico Environment Department
OB	Oversight Bureau
Order	Compliance Order on Consent
PETN	pentaerythritol tetranitrate
ppm	parts per million
QC	quality control
RCRA	Resource Conservation Recovery Act
RDX	1,3,5-trinitroperhydro-1,3,5-triazine
Sandia	Sandia Corporation
SAR	SWMU Assessment Report
SNL	Sandia National Laboratories
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
the Site	Building 9938 Surface Discharge Site
UCL	upper confidence limits
VCA	voluntary corrective action
VOC	volatile organic compound

1.0 INTRODUCTION

This investigation report describes the Voluntary Corrective Action (VCA) completed at the Solid Waste Management Unit (SWMU) 502, Building 9938 Discharge Site (referenced in this report as SWMU 502 and the Site) located at Sandia National Laboratories/New Mexico (SNL/NM) Coyote Test Field. The goal of the VCA was to reduce any potential impacts to human health and the environment through investigation and remediation of the Site. This investigation report addresses the remediation initiative, including collection of surface and subsurface soil samples, validation of analytical results, and risk assessment.

The VCA was prepared in accordance with Section VI.H.3 and VI.H.4 of the Compliance Order on Consent (Order) between the U.S. Department of Energy (DOE), Sandia Corporation (Sandia), and the New Mexico Environment Department (NMED) (NMED April 2004). This Investigation Report presents the results of the VCA as required by the Order.

2.0 SWMU 502, BUILDING 9938 DISCHARGE SITE

2.1 Location

SWMU 502 encompasses approximately 250 square feet of federally owned land controlled by Kirtland Air Force Base and permitted to the DOE. Building 9938 is located west of Lovelace Road, approximately 0.3 miles south of Coyote Springs Road, and one mile north of the Solar Test Facility (Figure 2-1). The Site consists of exposed soil in a shallow engineered depression located approximately 65 feet south of Building 9938, adjacent to a small earthen berm capped with vegetation. The area is generally flat with a gentle slope to the west. Vegetation primarily consists of desert grasses, cacti, and tumbleweeds. Some debris, including metal, asphalt, and concrete, is present near the Site.

Precipitation is low in the region (approximately eight inches per year) and surface runoff is minimal. The soil infiltration rate is estimated to be on the order of 0.1 centimeter per year (cm/yr), which yields seepage velocities ranging from 0.03 to 11.8 cm/yr (SNL/NM March 1995). The depth to groundwater is approximately 350 feet, based upon data from a former groundwater monitoring which was located approximately 1100 feet northwest of SWMU 502. This is the closest point where the actual depth to groundwater has been measured.

SWMU 502 is located within the boundary of SWMU 103, Scrap Yard (Building 9939). In July 2000, the NMED approved SWMU 103 as Corrective Action Complete (CAC) (NMED July 2012). SWMU 502 is also near but not within the boundary of SWMU 150, Buildings 9939/9939A Septic System and Drainfield (Coyote Test Field). The CAC status is pending for SWMU 150.

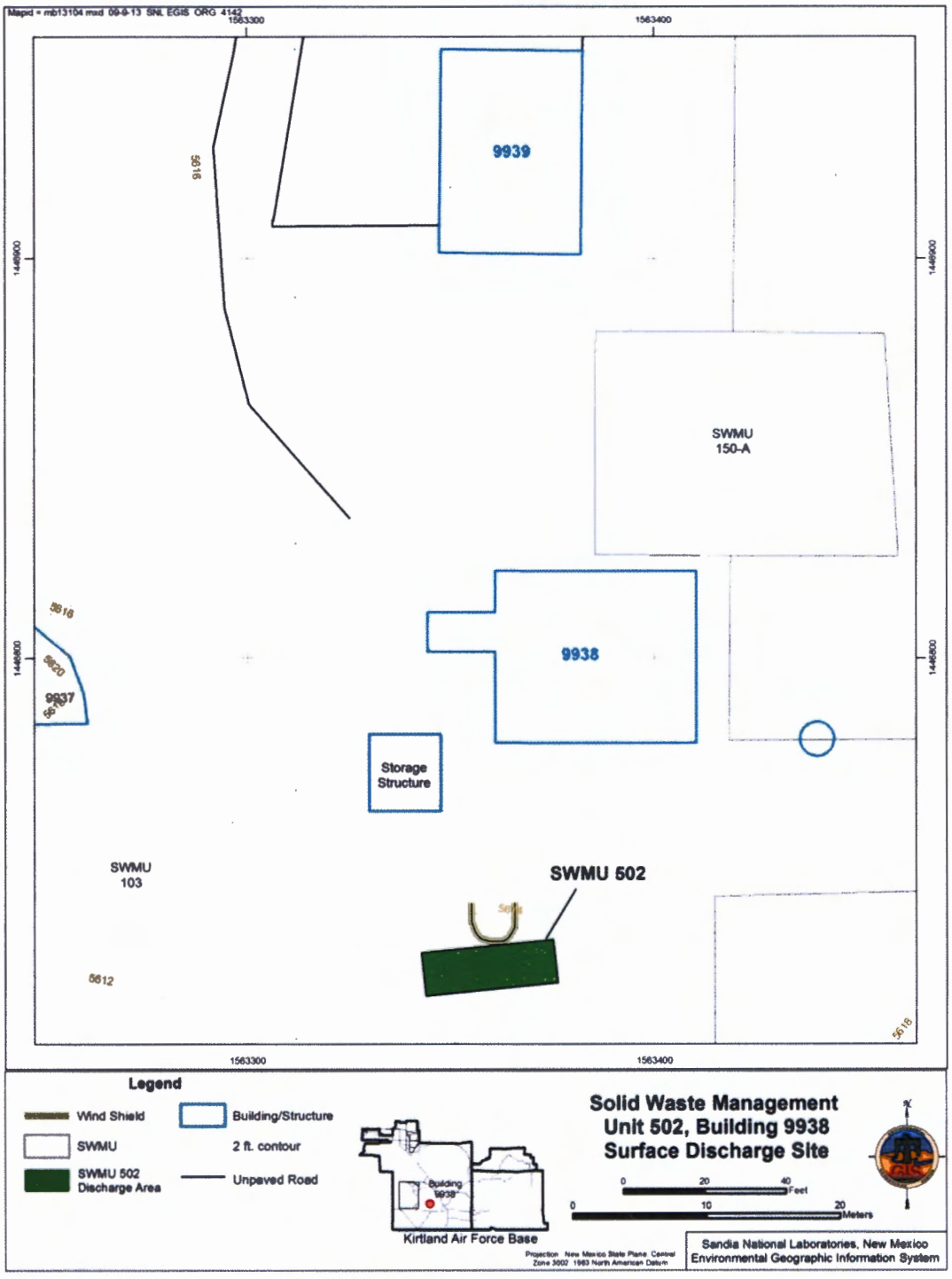

Figure 2-1
Solid Waste Management Unit 502 Surface Discharge Site Map

2.2 History of Discharge Site

Sandia National Laboratories (SNL) personnel periodically conducted research and development activities involving the production, isolation, and purification of materials used in the synthesis of explosives at Buildings 9938 and 9939. Activities related to this VCA were conducted from July 2010 to September 2012.

The wastewater generated from each synthesis activity was containerized in polyethylene plastic containers and discharged to the ground surface in an area south of Building 9938. The volume of wastewater discharged from each synthesis activity was conservatively estimated at ten gallons per event. A total of 25 synthesis activities were held from July 2010 through September 2012, thus a total of approximately 250 gallons of wastewater was discharged to the ground surface. Wastewater characteristics are summarized in Section 2.2.1 of this report.

The DOE and Sandia formally notified the NMED of this newly identified or suspected SWMU by letter dated December 19, 2012 (DOE December 2012). In January 2013, an inspection of the discharge area was performed, with assistance from personnel associated with the processes that generated the wastewater. Several small zones of discolored soil within a total area approximately 10 feet wide by 25 feet long were identified. No odors were present and there was no evidence of staining on surfaces surrounding the discharge area.

The DOE and Sandia submitted a SWMU Assessment Report (SAR) to NMED on February 12, 2013 (DOE February 2013). On April 2, 2013 supplemental information was submitted to the NMED including a summary of analytical results for surface soil samples collected in January 2013. The submittal included a statement of intent to conduct a VCA (DOE April 2013). The NMED approved the SWMU Assessment Report on April 3, 2013 (Kieling April 2013).

The DOE and Sandia submitted a VCA Plan to NMED on June 7, 2013 (DOE June 2013). On July 23, 2013, SNL personnel completed all field activities outlined in the VCA Plan. Table 2-1 provides a historical timeline for SWMU 502.

Photos of SWMU 502 and the surrounding area are provided in Appendix A.

Table 2-1
Historical Timeline for SWMU 502

Month	Year	Event	Reference
Multiple	2010–2012	25 synthesis activities conducted from July 2010 through September 2012;, resulted in approximately 250 gallons of discharged wastewater to the ground surface.	DOE February 2013
December	2012	Notification of newly identified or suspected SWMU sent to NMED.	DOE December 2012
January	2013	SAR prepared and submitted to NMED for approval.	DOE February 2013
January	2013	Surface soil sampled for high explosives, organic compounds, metals, nitrate plus nitrite, and perchlorate.	DOE April 2013
April	2013	SAR supplement submitted to NMED.	DOE April 2013
April	2013	NMED approval of SAR.	Kieling April 2013
June	2013	VCA Plan submitted to NMED.	DOE June 2013

Refer to footnotes at end of table.

Table 2-1 (Concluded)
Historical Timeline for SWMU 502

Month	Year	Event	Reference
July	2013	Expanded area surface and subsurface soil sampling conducted for high explosives, metals, and perchlorate.	VCA Investigation Report
November	2013	VCA Investigation Report submitted to NMED.	VCA Investigation Report

DOE = U.S. Department of Energy
NMED = New Mexico Environment Department.
SAR = Solid Waste Management Unit Assessment Report.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.
VCA = Voluntary Corrective Action.

2.2.1 Wastewater Characteristics

The chemical makeup of the wastewater discharged to the surface soil is based upon information provided by personnel associated with its generation. The information indicated the wastewater consisted of a dilute solution of sodium nitrate, sodium chloride salts, and soluble sulfates. Minor amounts of grease and oil, and chemicals used during the nitrate-based processes, may have also been present. Chemicals and compounds used during the various synthesis activities include those listed in Table 2-2.

Table 2-2
Chemicals and Compounds Used in Building 9938/9939 Synthesis Activities

Hydrochloric Acid	Water	Sodium Carbonate	Ammonium Sulfate
RDX	Potassium Nitrate	Acetone	Calcium Nitrate
Isopropanol	Sodium Bicarbonate	Sulfuric Acid	Calcium Sulfate
Nitric Acid	Ammonium Nitrate	Hexamine	Pentaerythritol
Urea	Sodium Nitrate	Ethanol	Calcium Phosphate
Pentaerythritol tetranitrate	Erythritol	Propylene Glycol	Sodium Chloride
Nitrotoluenes	Trinitrotoluene	Dinitrotoluene	Cyclotrimethylene trinotrosamine

2.2.2 Current Land Use

The current land use at SWMU 502 and in the surrounding area is industrial. No activities other than industrial activities are anticipated at this site and surrounding area in the future.

2.2.3 Proposed Land Use

The proposed land use at SWMU 502 and in the surrounding area is industrial. No activities other than industrial activities are anticipated at this site and surrounding area in the future.

2.3 January 2013 Surface Soil Sampling Results

A total of nine environmental samples, plus one duplicate sample, were collected from nine locations; four "biased samples" from discolored soil surfaces within the discharge area and five

samples from locations in the vicinity of SWMU 502. Analytical results were reviewed and compared to the approved background concentrations for SNL/NM (Dinwiddie September 1997) and residential screening levels found in the *New Mexico Environment Department Risk Assessment Guidance for Site Investigation and Remediation*, (NMED June 2012). All results were below background concentration levels and residential soil screening levels, except barium and pentaerythritol tetranitrate (PETN), respectively. Barium was reported above the SNL/NM background concentration level of 130 parts per million (ppm) at concentrations ranging from 162 ppm to 268 ppm. PETN was detected above the regional residential soil screening level of 120 ppm in one sample at a concentration of 142 ppm. All other samples were below the regional residential screening level at concentrations ranging from 1.76 ppm to 115 ppm. The January 2013 results were incorporated into the data set used for risk analysis, as summarized in Section 5.0 and discussed in greater detail in Appendix B of this report.

Based upon analytical results from the surface soil samples, a VCA Plan was prepared to facilitate determining the nature and extent of HE compounds at SWMU 502 and, if necessary, remove soil material that exceeded clean-up goals.

3.0 REGULATORY CRITERIA

The NMED Hazardous Waste Bureau has been delegated the authority to implement and enforce federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs, with the exception of SWMU 502, are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993).

All corrective action requirements pertaining to SWMU 502 are contained in the Order (NMED April 2004). The investigations at SWMU 502 have been conducted voluntarily by SNL/NM in accordance with Sections VI.H.3 and VI.H.4 of the Order (NMED, April 2004). This Investigation Report is prepared in accordance with Sections VI.H and VII.D.5.(a) of the Order (NMED April 2004).

4.0 VCA AND INVESTIGATION ACTIVITIES

The VCA at SWMU 502 was performed in accordance with the *LTS Voluntary Corrective Action Plan for Building 9938 Surface Discharge Site* (DOE June 2013), which was the Work Plan to conduct the corrective action activities. The VCA was performed to reduce any potential impacts to human health and the environment through remediation. Surface and subsurface soil sampling was performed to determine the nature and extent of HE compounds, and sample data were compared to clean-up goals. No soil material or debris was removed from the site since soil sampling results did not exceed clean-up goals. The solid waste generated during the sampling activities was managed and disposed in compliance with SNL Corporate Procedure ESH100.2.ENV.26 *Manage Non-Hazardous Solid Waste at SNL/NM.*

4.1 Soil Sampling

SNL/NM personnel conducted a VCA at SWMU 502, including surface soil sampling, subsurface soil sampling, complete site assessment, and determination of the final recommendation for site closure. Soil samples were analyzed for high explosive (HE) compounds, perchlorate, Target Analyte List (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), perchlorate, and nitrate plus nitrite (NPN) as summarized in Table 4-1. In January 2013, surface soils samples were analyzed using all analytical methods listed in Table 4.1. Based upon January 2013 sampling results, soil samples were collected in July 2013 for HE compounds from unconsolidated material at surface, 2 feet (ft) below ground surface (bgs), and 5 ft bgs. Additional samples for TAL metals and perchlorate were also collected for analysis in July 2013. During January 2013 and July 2013, surface and subsurface samples were collected from 22 locations, 9 sample locations in the discharge area and the remaining 13 sample locations within an approximate radius of 150 feet of the discharge area. January 2013 and July 2013 soil sample parameters are summarized in Table 4-2 and locations are shown on Figure 4-1.

Table 4-1
Analytical Parameters for SWMU 502 VCA Soil Samples

Analyte	Analytical Method	Soil Container Requirements	Reference
High Explosives (HE)	SW846-8321	250 mL, G	EPA 1986 (and updates)
Perchlorate	EPA 314.0	250 mL, P	EPA 1999 (and updates)
Target Analyte List (TAL) Metals	SW846-6010/6020/7470	250 mL, P	EPA 1986 (and updates)
Volatile Organic Compounds (VOCs)	SW846-8260B	125 mL, G	EPA 1986 (and updates)
Semivolatile Organic Compounds (SVOCs)	SW846-8270C	500 mL, G	EPA 1986 (and updates)
Nitrate plus Nitrite (NPN)	EPA 353.2	500 mL, G	EPA 1999 (and updates)

EPA = U.S. Environmental Protection Agency.
G = Glass.
mL = Milliliter(s).
P = Plastic.
SW = Solid Waste.

Table 4-2
Summary of SWMU 502 VCA Soil Samples

Sample Location	Sample Interval (ft bgs)	Sample Location Detail	Sample Date	ARCOC	Sample Number	Sample Type
DS-1	0–0.5	9938-SS-DS1	16-Jan-2013	614575	093369	Environmental
DS-2	0–0.5	9938-SS-DS2			093370	Environmental
	0–0.5	9938-SS-DS2			093371	Duplicate
DS-3	0–0.5	9938-SS-DS3			093372	Environmental
DS-4	0–0.5	9938-SS-DS4			093373	Environmental
BK-1	0–0.5	9938-SS-BK1			093374	Environmental
BK-2	0–0.5	9938-SS-BK2			093375	Environmental
BK-3	0–0.5	9938-SS-BK3			093376	Environmental
BK-4	0–0.5	9938-SS-BK4			093377	Environmental
BK-5	0–0.5	9938-SS-BK5			093378	Environmental
S-1	0–0.5	9938-VCA-S1-SS	23-Jul-2013	614967	094435	Environmental
	1.5–2.5	9938-VCA-S1-2			094451	Environmental
	4.5–5.5	9938-VCA-S1-5			094452	Environmental
S-2	0–0.5	9938-VCA-S2-SS			094436	Environmental
	1.5–2.5	9938-VCA-S2-2			094453	Environmental
	1.5–2.5	9938-VCA-S2-2			094454	Duplicate
	4.5–5.5	9938-VCA-S2-5			094455	Environmental
S-3	0–0.5	9938-VCA-S3-SS			094437	Environmental
	0–0.5	9938-VCA-S3-SS			094438	Duplicate
	1.5–2.5	9938-VCA-S3-2			094456	Environmental
	4.5–5.5	9938-VCA-S3-5			094457	Environmental
S-4	0–0.5	9938-VCA-S4-SS			094439	Environmental
	1.5–2.5	9938-VCA-S4-2			094458	Environmental
	1.5–2.5	9938-VCA-S4-2			094459	Duplicate
	4.5–5.5	9938-VCA-S4-5			094460	Environmental
S-5	0–0.5	9938-VCA-S5-SS			094440	Environmental
	1.5–2.5	9938-VCA-S5-2			094461	Environmental
	4.5–5.5	9938-VCA-S5-5			094462	Environmental
	4.5–5.5	9938-VCA-S5-5			094463	Duplicate
S-6	0–0.5	9938-VCA-S6-SS			094441	Environmental
	1.5–2.5	9938-VCA-S6-2			094464	Environmental
	4.5–5.5	9938-VCA-S6-5			094465	Environmental
S-7	0–0.5	9938-VCA-S7-SS			094442	Environmental
	1.5–2.5	9938-VCA-S7-2			094466	Environmental
S-8	0–0.5	9938-VCA-S8-SS			094443	Environmental
	0–0.5	9938-VCA-S8-SS			094444	Duplicate
	1.5–2.5	9938-VCA-S8-2			094467	Environmental
S-9	0–0.5	9938-VCA-S9-SS			094445	Environmental
	0–0.5	9938-VCA-S9-SS			094446	Duplicate
	1.5–2.5	9938-VCA-S9-2			094468	Environmental
S-10	0–0.5	9938-VCA-S10-SS			094447	Environmental
S-11	0–0.5	9938-VCA-S11-SS			094448	Environmental
S-12	0–0.5	9938-VCA-S12-SS			094449	Environmental
S-13	0–0.5	9938-VCA-S13-SS			094450	Environmental

9938 = Building 9338.
ARCOC = Analysis Request and Chain of Custody record.
ft bgs = Foot (feet) below ground surface.
VCA = Voluntary Corrective Action.