LANL 20034

LA-UR-03-6494
September 2003
ER2003-0515

IM Completion Report for the NTISV Hot Demonstration at SWMU 21-018(a)-99 (MDA V)

Los Alamos
NATIONAL LABORATORY

Los Alamos NM 87545

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Produced by
Risk Reduction and Environmental Stewardship–Remediation Services

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EXECUTIVE SUMMMARY

The US Department of Energy sponsored a demonstration of nontraditional in situ vitrification (NTISV) technology at Los Alamos National Laboratory (the Laboratory). NTISV is a treatment technology that involves melting contaminated media in place and allowing the melt to cool into glass. Contaminants such as radionuclides and metals are homogenized within the melt due to convective mixing and immobilized within the resulting glass. Organic contaminants are destroyed by the high temperatures reached during vitrification.

For the NTISV demonstration, two large-scale demonstration melts were conducted at the Laboratory's Technical Area (TA)-21. The first, called the "cold" demonstration, was performed in April 1999 on a simulated absorption bed that contained surrogate contaminants. The second, called the "hot" demonstration, took place in April 2000 at the Laboratory's Material Disposal Area (MDA) V, which is part of consolidated Solid Waste Management Unit (SWMU) 21-018(a)-99. MDA V contains three absorption beds that received radionuclide- and metal-contaminated wastewater from a laundry facility and a waste research laboratory from the mid-1940s to the early 1960s.

This interim measure (IM) completion report presents the results of the NTISV hot demonstration. The hot demonstration, which was performed on a portion of absorption bed 1 at MDA V, was conducted as an IM because it was not intended to be a final remedy for SWMU 21-018(a)-99. The primary objective of the IM was to obtain data on the effectiveness of NTISV and to determine whether it would be a suitable remedial alternative for all of MDA V.

Several monitoring and sampling/analytical activities were conducted to evaluate the NTISV technology used at MDA V. Monitoring activities were conducted to track air emissions, melt progression, and glass cooling rate. Sampling and analytical activities included characterization of the absorption-bed materials to confirm the nature and extent of contamination, comparison of pre- and post-demonstration analytical data from the tuff adjacent to the melt to evaluate contaminant migration, chemical and radiological analysis to determine contaminant distribution in the vitrified mass, leaching tests to evaluate glass durability, and mineralogical characterization to evaluate glass homogeneity.

Based on the results of the monitoring and sampling conducted during the hot demonstration, NTISV effectively processed the desired treatment volume at MDA V and the resulting glass was both homogeneous and durable. There was no evidence that contaminants were driven from the absorption bed into the surrounding tuff during heating. Furthermore, the off-gas recovery and treatment system effectively controlled emissions generated during vitrification. However, cost information from the demonstration suggests NTISV would be more expensive than excavation and disposal of the absorption-bed materials as low-level radioactive waste.

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1.0 INTRODUCTION

Los Alamos National Laboratory (the Laboratory) is a multidisciplinary research facility owned by the US Department of Energy (DOE) and managed by the University of California. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe.

The DOE sponsored an evaluation of nontraditional in situ vitrification (NTISV) technology as a potential remedy for treating radioactively contaminated absorption beds at the Laboratory's Material Disposal Area (MDA) V. NTISV is a treatment technology that immobilizes or destroys contaminants by melting the contaminated media in place to produce a durable glass monolith.

The NTISV demonstration at the laboratory involved the performance of two large-scale melts: a "cold" demonstration in an area that had no radioactive contaminants and a "hot" demonstration at a contaminated area within MDA V. In March 1999, the DOE, the Laboratory, and the New Mexico Environment Department (NMED) agreed to conduct the demonstration at MDA V to obtain data on the effectiveness of this technology. DOE, the Laboratory, and NMED further agreed the demonstration could be most effectively implemented as an interim measure (IM), because the NTISV treatment was not intended to be a final remedy for MDA V.

MDA V is located within technical area (TA)-21 on the west end of Delta Prime (DP) Mesa near the Laboratory's northern boundary (Figure 1.0-1). It is part of consolidated Solid Waste Management Unit (SWMU) 21-018(a)-99, which consists of four SWMUs and an area of concern (AOC):

- SWMU 21-018(b), a former laundry facility for radioactively contaminated clothing;
- SWMU 21-018(a), three wastewater absorption beds (MDA V);
- SWMU 21-023(c), a former septic system for a waste research laboratory;
- SWMU 21-013(b), a surface disposal area; and
- AOC 21-013(g), two unidentified drainlines and building debris.

The SWMUs that make up consolidated SWMU 21-018(a)-99 are included in Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 01585); AOC 21-013(g) is not. The NTISV hot demonstration and this IM completion report deal only with a portion of absorption bed 1 in MDA V [SWMU 21-018(a)].

1.1 Demonstration Objectives

In April 2000, NMED approved the IM plan for SWMU 21-018(a)-99 and the NTISV hot demonstration at MDA V was conducted in accordance with this plan (LANL 2000, 70037; NMED 2000, 66403). As stated in the IM plan, the primary objective of the demonstration was to obtain data on the effectiveness of NTISV and to determine whether it would be a suitable remedial alternative for all of MDA V. Other objectives of this demonstration were to

- evaluate the vitrified mass to determine its durability and homogeneity,
- confirm the desired treatment volumes had been processed and contaminants had not been driven into the surrounding tuff during vitrification,
- use information and data gathered from the cold demonstration to optimize the performance and technical value of the hot demonstration, and
- evaluate air emissions from the NTISV technology.

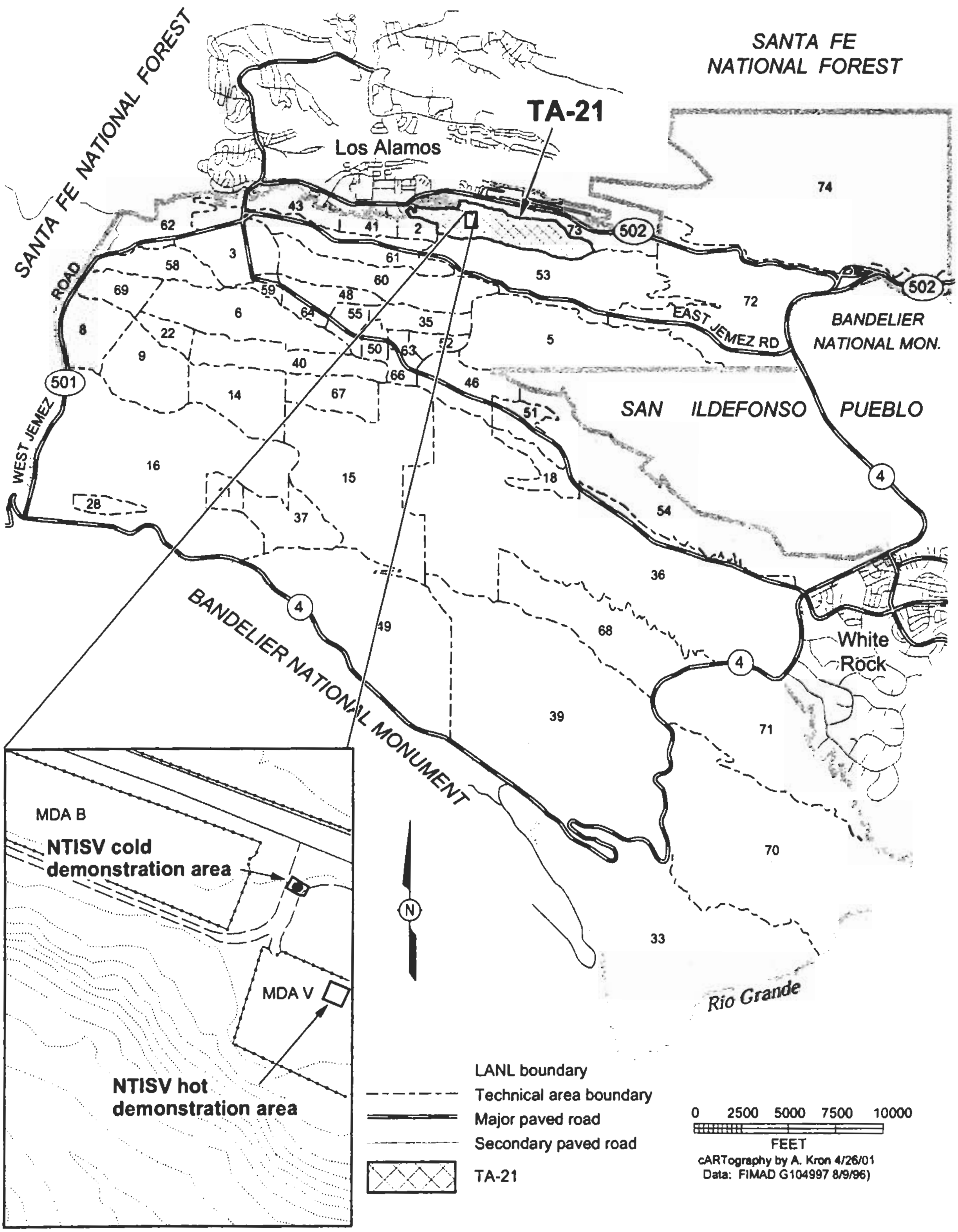

Figure 1.0-1. Locations of MDA V and NTISV demonstration areas with respect to Laboratory TAs and surrounding landholdings

The approved IM plan describes the success criteria for the NTISV hot demonstration (LANL 2000, 70037). These criteria are (1) determining the durability of the vitrified product, (2) determining the physical configuration of the vitrified product, (3) evaluating the homogeneity of contaminants within the melt, and (4) characterizing the vitrified product. Product durability, which is measured by the resistance of the glass to leaching, was determined by using the toxicity characteristic leaching procedure (TCLP) and the American Society for Testing and Measurement (ASTM) product consistency test (PCT) (ASTM 1998, 64040). The physical configuration of the vitrified product was determined by evaluating borehole information, pre- and postdemonstration tomography results, electricity consumption, and electrode depths. The glass homogeneity and other characteristics were determined using different analytical methods such as chemical analysis (i.e., target analyte list [TAL] metals and radionuclides by alpha and gamma spectroscopy), x-ray fluorescence (XRF), scanning electron microscopy (SEM), and electron microprobe analysis (EMPA).

1.2 Report Organization

This IM report follows the Risk Reduction and Environmental Stewardship-Remediation Services (RRES-RS) IM report format. Section 1 of this IM report introduces the NTISV demonstration and its objectives. Section 2 describes IM activities at MDA V and the results and conclusions of the hot demonstration. Section 3 discusses the management of waste generated during the IM. Section 4 lists references cited in this document. Appendix A defines acronyms used in this report. Appendix B consists of borehole logs. Appendix C discusses data quality and Appendix D provides the analytical data related to this IM. Appendix E discusses estimated project costs. Appendix F is a copy of the approved IM plan. Appendix G contains photographs of IM activities and the vitrified product.

2.0 NTISV HOT DEMONSTRATION AT MDA V

2.1 Demonstration Description

In situ vitrification (ISV) is a thermal treatment process that uses electrically generated heat to melt contaminated soil and/or rock in place. Melting is accomplished by passing electrical current between electrodes that have been inserted into contaminated media. Temperatures up to 2000°C are reached during vitrification. When electrical power is terminated, the molten mass cools and hardens into a glass monolith. The high temperatures generated during the vitrification process destroy any organic contaminants present in the treatment zone. Metals and radionuclides are distributed uniformly in the melt due to convective mixing, and are immobilized in the resulting glass. Volatile constituents driven off during heating are collected under an off-gas hood that covers the treatment area and are drawn into an off-gas treatment system.

Traditional ISV technology involves horizontally oriented melts that originate at the surface and move down through the treatment zone. The NTISV technology demonstrated at MDA V was the GeoMelt® subsurface planar ISV, which involves vertically oriented melts that originate in the subsurface at the desired treatment depth. This technology has been used on a full-scale commercial basis to treat contaminated sites within the United States, Japan, and Australia (MSE 2001, 70157).

The NTISV demonstration at the Laboratory was conducted in two phases. The cold demonstration was conducted in April 1999 near MDA V in a simulated absorption bed that contained no radioactive contamination. The hot demonstration was performed in April 2000 within a portion of MDA V absorption bed 1 that was contaminated primarily by metals and radionuclides. Figure 2.1-1 shows the location of the hot and cold demonstrations.

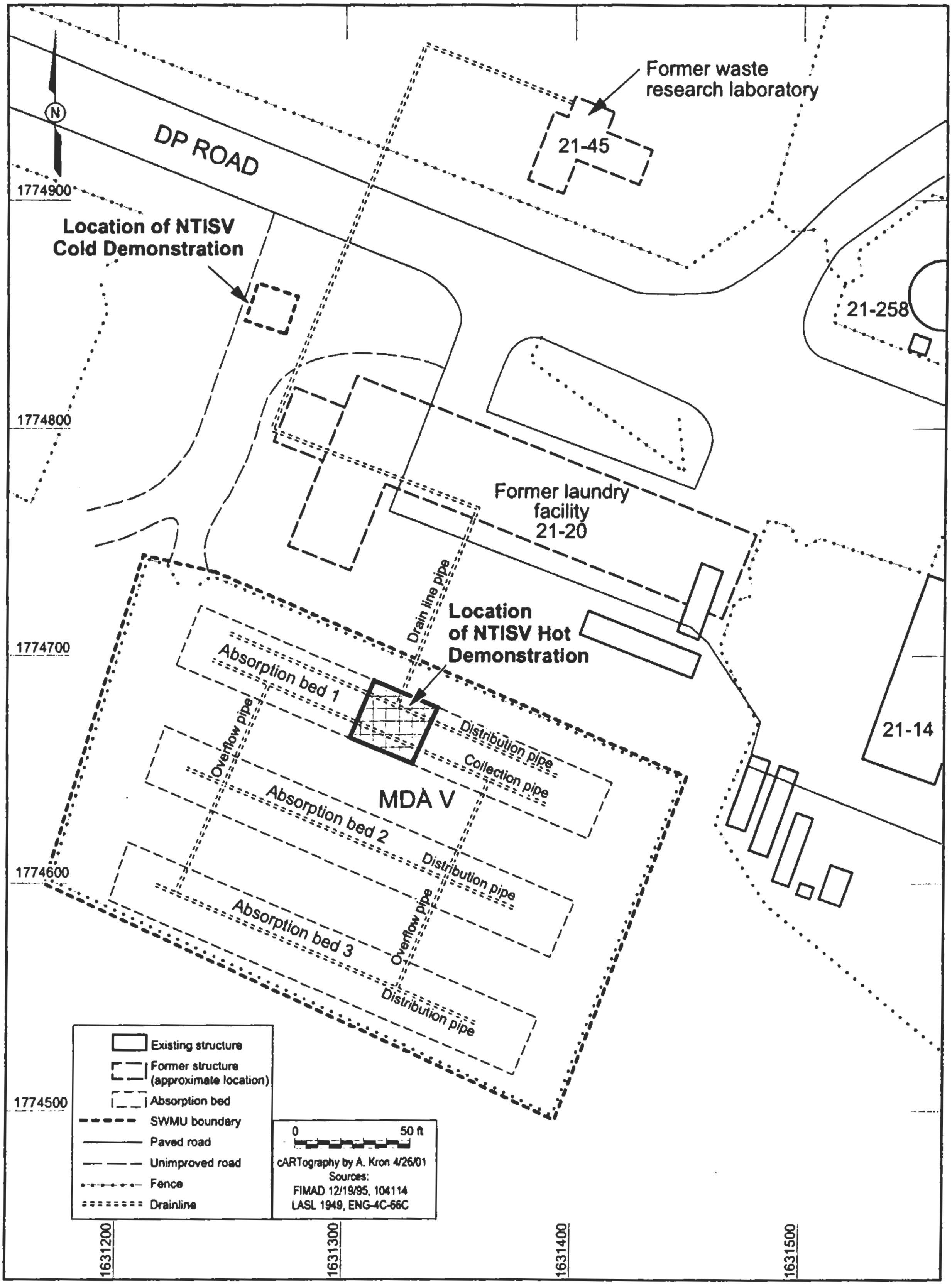

Figure 2.1-1. Locations of NTISV demonstration areas and waste-disposal features, MDA V

This IM report presents the findings of the hot demonstration. The cold demonstration was completed as a voluntary corrective measure (VCM) (LANL 2002, 73107).

2.2 Site Description and Operational History

TA-21 was used for plutonium research and metal production from 1945 to 1978. MDA V consists of three crushed tuff-, cobble-, and gravel-filled absorption beds constructed to dispose of wastewater that originated from the DP laundry facility (Building 21-20) and a waste research laboratory (Building 21-45).

The absorption beds, which are approximately 25 ft wide x 200 ft long and 8 ft deep, received effluent from the DP laundry facility from 1945 to 1961. The laundry facility was used to launder protective coveralls worn during research and production operations at TA-21, and generated approximately 2M gal. of radioactively contaminated wastewater annually (Abrahams 1962, 1306). The absorption beds received nearly 40M gal. of effluent over the operating life of the laundry facility.

In addition, MDA V received liquid waste from the waste treatment laboratory from 1950 to 1953. Engineering drawing ENG 4C-660 shows a 0.75-in. line connecting a sump in Building 21-45 to absorption bed 1 (Francis 1999, 63095). A pump was installed to move liquids from the sump to the absorption beds. The volume of liquid waste discharged from the waste treatment laboratory to MDA V is not known.

Based on information from engineering drawing ENG-C 2218, the three MDA V absorption beds were connected by a series of distribution, collection, and overflow pipes (Figure 2.1-1). The system was designed to allow the first bed to fill with wastewater via the distribution pipe to a depth of approximately 24 in. from the bottom of the absorption bed before the overflow pipes carried water to the next absorption bed.

2.3 Previous Investigations

As early as 1946, sampling of MDA V effluents and soils indicated the presence of elevated levels of alpha- and beta-emitting radionuclides. Surface-soil samples collected in 1954 reportedly contained over 11,000 pCi/g of plutonium. The quality of these data, which were obtained using an adaptation of early radiochemistry methods originally developed to determine the amount of plutonium in human urine (Hermann 1954, 5654), is unknown.

From 1980 through 1986, data were collected from MDA V to characterize the distribution of radionuclides in the surface and shallow subsurface at MDA V. Analytical results for vegetation and surface-soil samples indicated concentrations of tritium, uranium, plutonium-238, and plutonium-239 greater than maximum background levels; subsurface-soil sample results indicated tritium, uranium, and plutonium-239 at concentrations greater than the maximum background levels (LANL 1991, 7529; Purtymun 1987, 6687; ESG 1987, 7431).

In 1985, a soil cover was placed over MDA V to repair erosion damage (Hakonson 1986, 6574). In October 1990, surface-soil samples of this soil cover were collected and showed no results above baseline radionuclide parameters, based on TA-21-specific parameters in use at that time (LANL 1996, 54969; Environmental Restoration Project 1996, 58239).

In 1994 and 1996, Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) activities were conducted to characterize potential contamination at MDA V. In 1994, six boreholes were drilled and sampled (five within the boundaries of the three absorption beds and one outside the absorption beds). In 1996, a geophysical survey was conducted, additional samples were collected near the borehole located outside the boundaries of the absorption beds, and two trenches were excavated in absorption bed 1. Four samples were collected from the trench excavated across the east end of absorption bed 1. Two samples were collected from the second trench excavated at the point where the geophysical survey identified the drainline from the former DP laundry facility.

Evaluation of the MDA V Phase I RFI sample results indicated inorganic chemicals and radionuclides were present at concentrations greater than background values (BVs) defined for the Laboratory area soil and tuff (Environmental Restoration Project 1998, 59730). Organic chemicals (acetone, 2-butanone, butyl benzylphthalate, carbon disulfide, di-n-butyl phthalate, diethyl phthalate, and styrene) were detected in the RFI samples, but none at concentrations in excess of screening action levels (SALs). Antimony, cadmium, copper, lead, mercury, total uranium, americium-241, cesium-137, plutonium-238, plutonium-239/-240, strontium-90, tritium, and uranium-234, -235, and -238 were greater than their respective SALs. The radionuclide concentrations greater than SALs in absorption bed 1 were concentrated in the cobble layer between 3.5 and 7 ft below ground surface (bgs) (LANL 1996, 54969).

2.4 Interim Measure and Related Activities

2.4.1 Site Preparation Activities

IM field activities began February 1, 2000. The proposed demonstration area was cleared of vegetation and the edges of absorption bed 1 were excavated and marked. MDA V fencing was removed temporarily to allow entry of demonstration equipment. Portions of the distribution and collection pipes were removed to avoid a possible electrical short circuit, as well as a potential health and safety hazard when the NTISV electrodes became active. An inactive water line located west of absorption bed 1 was cut and removed.

The location of the melt proposed in the approved IM plan (the west end of absorption bed 1) was changed after radiation field-screening results showed no elevated radiation in that area (LANL 2000, 70037). A new location for the hot demonstration was selected and prepared near the center of absorption bed 1 where wastewater from the former laundry building entered the absorption bed (Figure 2.1-1). It was chosen because field-screening instruments (Eberline ESP-1 beta/gamma meter and Ludlum alpha meter) registered radioactivity at 10,000 disintegrations per minute (dpm) in and around the 6-in. drainline from the DP laundry facility. Local baseline values determined for this survey were approximately 400 dpm.

Before the hot demonstration, the native Bandelier tuff bedrock was fractured to prevent bridging above the subsidence crater during melting. Bridging results when materials above the melt fail to collapse as volume reduction occurs, thus creating a subsurface cavity. Bridging must be prevented to ensure vitrification of the overlying material.

A 2-ft layer of clean fill was added to level the site and provide insulation. Based on operational improvements identified during the cold demonstration, ports were added to the off-gas hood to allow the addition of overburden as the melt progressed. Adding overburden ensured that insulation was maintained when the original fill had been incorporated into the melt.

Following site preparation, electrodes were placed in four boreholes drilled to 15 ft bgs and graphite-based starter-path material was injected to form two vertically oriented planes of starter material between the northern and southern electrode pairs. Injection tests were conducted prior to the cold demonstration to determine the optimal injection pressure for subsurface materials in the MDA V area. Following injection of the starter material, resistance measurements were taken to confirm an electrically conductive path had been established between the electrode pairs. Figure 2.4-1 shows the electrode and starter-path configurations.

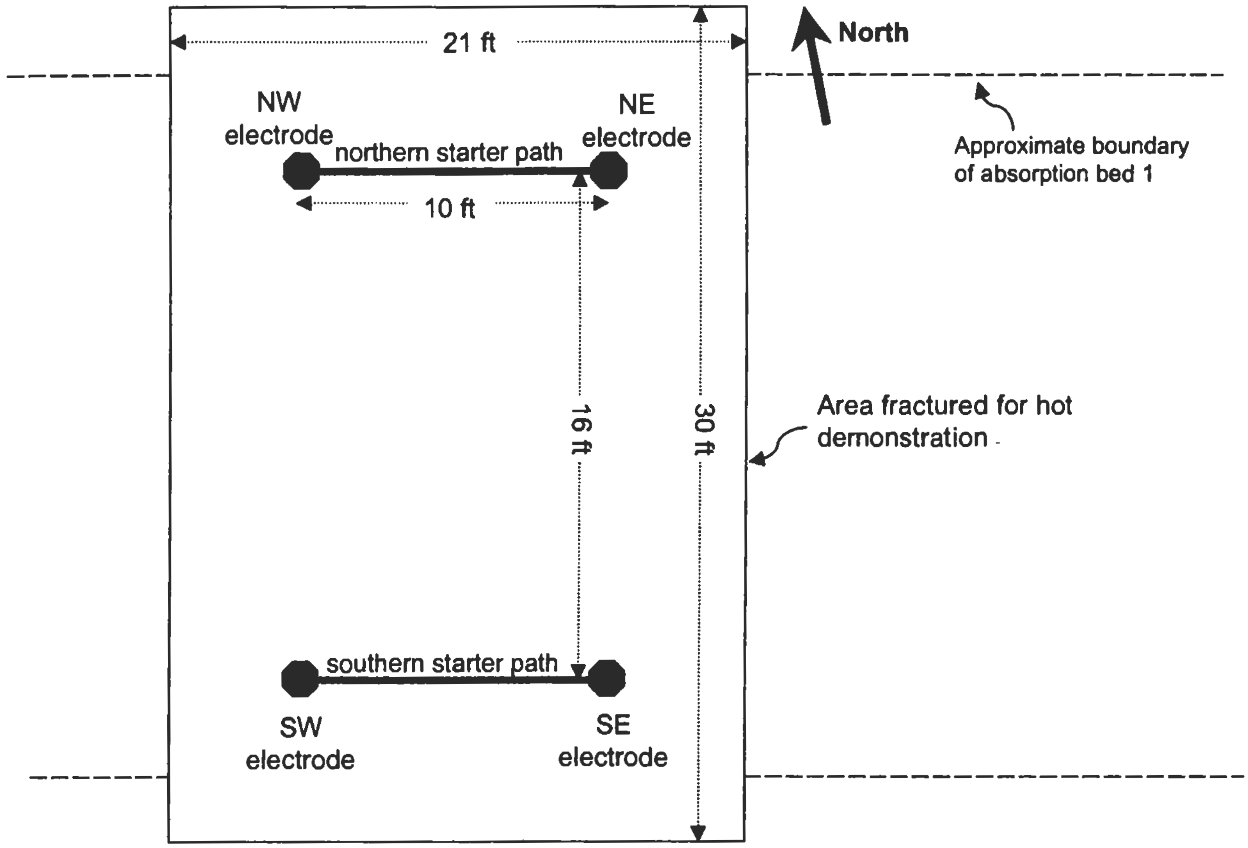

Figure 2.4-1. Hot demonstration electrode and starter-path configurations, MDA V

2.4.2 Vitrification

Electricity to the hot demonstration was turned on April 4, 2000. No subsidence of the overburden occurred during the first several days of the melt, indicating the overburden had formed a bridge rather than collapsing into the melt. Power was turned off for 11 days to allow operations that would collapse the bridging, which was achieved with a vibratory hammer attachment on a backhoe. The power was restarted and the expected subsidence was observed. As overburden was incorporated slowly into the melt from above, coarse gravel was added periodically through the ports in the off-gas hood to maintain a good insulating cover over the melt. Power to the hot demonstration was turned off on April 28, 2000.

2.4.3 Monitoring Activities and Results

2.4.3.1 Off-Gas Monitoring

The off-gas treatment system used during the hot demonstration consisted primarily of the following components:

- an off-gas collection hood, to collect off-gases from the treatment zone;
- a preheater, to remove condensate;
- a high-efficiency particulate air (HEPA) pre-filter assembly, to remove particulates;
- a cooling chamber, which allowed the off-gases to cool;

- a main HEPA filter unit, to remove remaining particulates; and
- a thermal oxidizer, to destroy any organic compounds, convert carbon monoxide to carbon dioxide, and eliminate potential odors.

The preheater was added to the hot demonstration off-gas treatment system based on operational improvements identified during the cold demonstration conducted in April 1999.

Monitoring Radionuclides and Metals in Air Emissions

Before the hot demonstration, air emissions were estimated to determine the applicability of monitoring and US Environmental Protection Agency (EPA) preconstruction approval requirements. Dose estimates were calculated for both controlled (i.e., subjected to HEPA filtration) and uncontrolled radionuclide emissions. Based on these calculations, both controlled and uncontrolled emissions were less than 0.1 mrem/yr at the nearest off-site receptor. Therefore, compliance emissions monitoring and EPA preapproval were not required for the hot demonstration.

Metal emissions were also estimated using the results of an EPA evaluation of NTISV technology. Based on these estimates, toxic metal emissions from the hot demonstration were determined to be below permitting thresholds.

During the hot demonstration, gases exiting the thermal oxidizer were sampled periodically for metals and radionuclides to confirm the estimates made prior to the demonstration. A summary of the results for metals and radionuclides in the gases exiting the thermal oxidizer is presented in Appendix D (Tables D-3.0-1 and -2). These particulate-related air emissions generally were below or near the detection limits of the analytical methods used, and confirmed that no pre-approval, monitoring, or permitting requirements applied to the hot demonstration.

Monitoring Source Air Emissions

Although the thermal oxidizer was an "exempted source," gases exiting the thermal oxidizer were sampled continuously. (An exempted source is equipment for which the state does not require air permitting or monitoring because it is deemed an insignificant source of air pollution.) Emissions from the MDA V thermal oxidizer were sampled for oxygen (required for combustion), carbon monoxide and carbon dioxide (combustion byproducts), and total hydrocarbons (unoxidized organics). These are typical emissions from combustion sources.

Total hydrocarbon emissions ranged from 0 to 1 ppm during the entire demonstration. Oxygen emissions were approximately 15 weight percent (wt %), which is less than ambient air content, as a result of propane fuel combustion in the thermal oxidizer. Carbon dioxide emissions averaged 5 wt %, as the result of combustion. Carbon monoxide was measured in air emissions at concentrations ranging from 15 to 50 ppm as a result of incomplete combustion in the thermal oxidizer. These values are similar to automobile air emissions (MSE 2001, 70157).

2.4.3.2 Melt Process Monitoring

During the vitrification process, electrode depth, subsidence volume, and electricity consumption were monitored to ensure that melt progressed as expected and to determine the physical configuration of the final vitrified mass. Pre- and postdemonstration seismic tomography was also used to determine the melt shape and dimensions.

Electrode Depth

The final electrode depth is used to determine the total depth (TD) of the melt. Initially the four electrodes were placed at 15 ft bgs. As melting progressed, the electrodes were lowered with a crane, to keep them at or near the bottom of the melt. At the end of the hot demonstration, the electrodes were 28.0 ft, 20.8 ft, 26.0 ft, and 29.4 ft bgs. These values approximate the depth to the melt bottom, at the corners where the electrodes were positioned. The variation in the depth seen in the four electrodes most likely is due to variations in absorption bed materials and underlying tuff (MSE 2001, 70157).

Subsidence Volume

During vitrification, a subsidence crater forms as a result of lost void space and volatile components (such as moisture and organic material). Typical volume reduction for natural materials ranges from 20% to 50%. Based on the density of the tuff at MDA V as well as the fill material present in the absorption beds, a volume reduction of 30% to 40% was expected as a result of vitrification (MSE 2001, 70157).

Because overburden was added to the top of the treatment area throughout vitrification, the resulting subsidence crater was approximately 3 ft deep and did not reflect total volume reduction. The percent of volume reduction can be estimated by dividing the depth to the melt surface by the overall average depth of the treatment area. Based on an approximate depth to the melt surface of 9 ft bgs and an average electrode depth of 26 ft bgs, the percent volume reduction was estimated to be 35% (9 ft/26 ft) at the end of the hot demonstration, which agrees well with the predicted volume reduction based on tuff and absorption bed material density (MSE 2001, 70157).

Electrical Consumption

Power, total energy input, voltage, and resistance were monitored as vitrification progressed to ensure that the melt progressed as expected. After a gradual increase in power at the start of the melt, power was maintained between 1000 and 2000 kilowatts (kW) over the duration of the demonstration. Power was on for a total of 289 hr. during the hot demonstration and total energy consumption was 276,300 kWh.

The demand for different voltages is a result of resistance differences in the material being melted, which in turn are controlled by bulk chemistry of the material and the size of the melt. During the NTISV demonstration, the expected variations in resistance were observed: resistance was highest at the beginning of the vitrification process when all materials were still solid. As materials began to melt, resistance decreased. Resistance increased again slightly during the effort to eliminate bridging, but decreased again after the overburden was incorporated into the melt (MSE 2001, 70157).

Seismic Tomography

Seismic tomography was conducted before and after the hot demonstration to estimate the size, shape, and location of the vitrified mass. This geophysical method measures seismic velocity, which is determined by the travel time of a pulse of seismic energy over a known distance. Seismic velocity is largely a function of density. Due to volume reduction, the density of the vitrified mass is significantly higher than the original absorption-bed materials. Therefore, differences in pre- and postdemonstration tomography results can be used to evaluate the physical configuration of the melt. Based on these results, the top of the vitrified mass is approximately 9 ft bgs and is approximately 25 ft wide x 15 ft thick (MSE 2001, 70157).

2.4.3.3 Temperature Monitoring of the Melt Surface

Following vitrification, a thermocouple was installed in a borehole drilled from ground surface to the top of the melt (approximately 10 ft bgs) in the approximate center. Surface temperatures of the glass were measured and recorded monthly for approximately two years to determine cooling rates and predict when the melt body could be cored. Figure 2.4-2 shows the measured cooling curve for the top surface of the vitrified mass. These data were input to a heat diffusion model to predict when the vitrified mass would reach ambient temperatures. Heat-diffusion modeling indicated the internal temperature of the melt would reach 40°C during the summer of 2002 (Environmental Restoration Project 2002, 76080). Temperatures measured within the boreholes drilled in the glass in June 2002 agreed with modeling results. Because of the insulating properties of the surrounding Bandelier tuff and the overlying fill, the glass took more than two years to return to near-ambient temperatures.

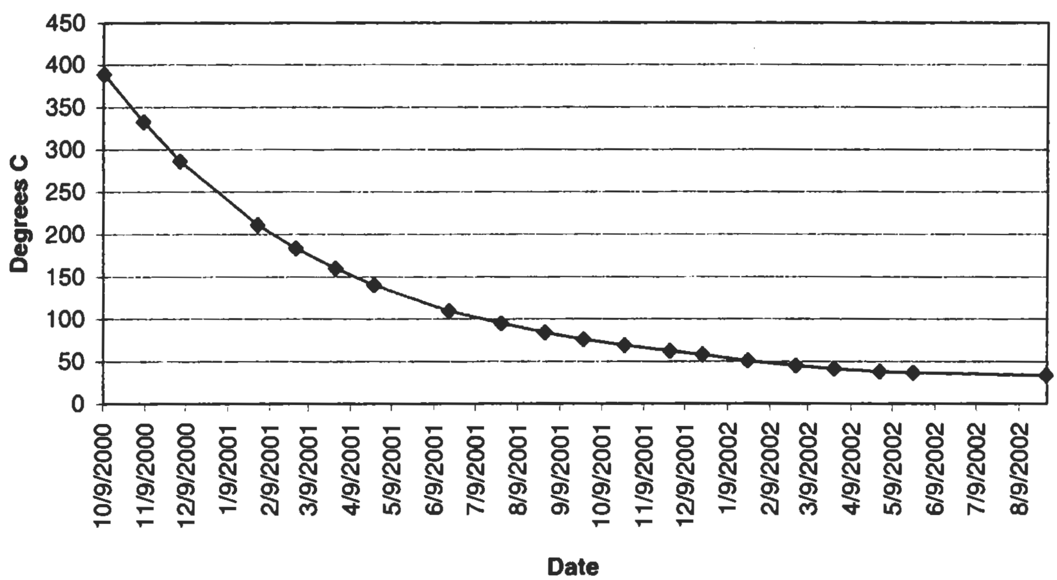

Figure 2.4-2. Measured cooling curve for top surface of NTISV hot demonstration melt, MDA V

2.4.4 Sampling Activities

Samples were collected both before and after the vitrification process to fully evaluate the NTISV technology. Prior to the hot demonstration,

- trench samples were collected at three depths from two locations adjacent to the treatment area to confirm the types and concentrations of contaminants present in absorption bed 1 before vitrification and
- three boreholes were drilled and sampled adjacent to the targeted treatment area to characterize conditions in the surrounding tuff before vitrification.

Following the hot demonstration (within five months),

- three boreholes were drilled and sampled as closely as possible to the premelt boreholes to allow evaluation of potential contaminant migration during the melt process and
- a borehole was drilled down to the top of the melt, in the approximate center, and a thermocouple was installed to monitor the cooling rate of the melt surface.

Approximately two years after the hot demonstration,

- three boreholes were drilled through the vitrified mass to collect a total of seven samples of the glass for characterization and
- one sample of tuff was collected beneath the vitrified mass to confirm the desired treatment volume had been processed and that mobile contaminants had not been driven into the surrounding tuff.

Figure 2.4-3 shows the locations of samples collected for the hot demonstration. The following sections describe the sampling activities in detail.

2.4.4.1 Absorption Bed Samples

Two trenches were excavated into absorption bed 1 to remove portions of the distribution and collection pipes from the demonstration area before vitrification. To better characterize the contaminants in the absorption bed, samples were collected from the distribution pipe trench (21-11111) and from the collection pipe trench (21-11112) approximately 10 ft east of the treatment area (Figure 2.4-3). At each location, samples were collected from 3 ft bgs in the crushed tuff layer, 5 ft bgs in the gravel layer, and 7 ft bgs in the cobble/boulder layer. The absorption-bed samples were analyzed for TAL metals, radionuclides by gamma spectroscopy, tritium, isotopic plutonium, isotopic uranium, and strontium-90.

2.4.4.2 Pre- and Postdemonstration Borehole Samples

Three predemonstration boreholes were drilled into tuff on the south side of absorption bed 1 to characterize the surrounding tuff before vitrification and to evaluate potential contaminant migration as a result of vitrification. Three predemonstration boreholes were drilled on the south side of absorption bed 1 (locations 21-11113, -11114, and -11115), stepping out to the south at approximately 5-ft intervals (Figure 2.4-3). Samples were collected from two depths in all three boreholes.

After vitrification, a postdemonstration borehole was drilled approximately two feet west of each predemonstration borehole; these postdemonstration boreholes were drilled at locations 21-11158, -11159, and -11160 (Figure 2.4-3). Samples were collected from the three postdemonstration boreholes at approximately the same depths as from the predemonstration boreholes.

Table 2.4-1 shows the depths and correlation of the pre- and postdemonstration samples. All these samples were analyzed for TAL metals, radionuclides by gamma spectroscopy, tritium, isotopic plutonium, isotopic uranium, and strontium-90.

2.4.4.3 Vitrified Mass and Subsurface Tuff Sampling

Attempts were made to drill the cold demonstration glass two weeks after melting; however, due to the elevated temperatures of the cold demonstration glass, core recovery was very poor. Based on difficulties experienced during the cold-demonstration glass coring, much more cooling time was allowed before the hot demonstration glass was cored.

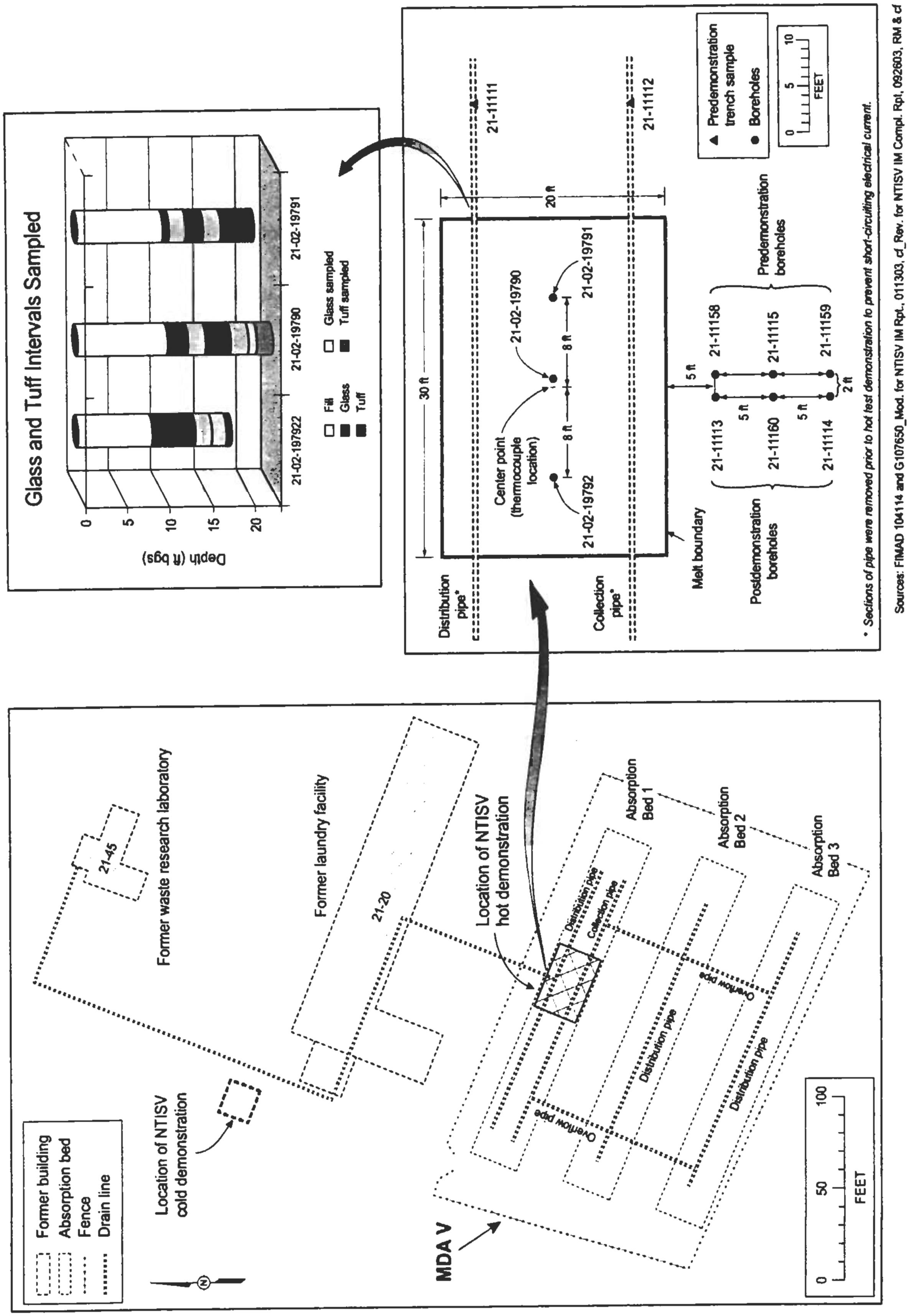

Figure 2.4-3. NTISV hot demonstration sample locations

Table 2.4-1
Pre- and Postdemonstration Borehole Locations and Sample Correlation, MDA V

Predemonstration			Postdemonstration		
Location ID	Sample ID	Depth (ft)	Location ID	Sample ID	Depth (ft)
21-11113	MD21-00-0007	11 to 12.5	21-11158	MD21-00-0025	11 to 12.5
	MD21-00-0008*	11 to 12.5		MD21-00-0026*	11 to 12.5
	MD21-00-0009	28 to 29		MD21-00-0027	28 to 29
21-11114	MD21-00-0010	11 to 12.5	21-11159	MD21-00-0028	11 to 12
	MD21-00-0011	28 to 29		MD21-00-0029	28 to 29
21-11115	MD21-00-0012	11 to 12	21-11160	MD21-00-0030	11 to 12
	MD21-00-0013	28 to 29		MD21-00-0031	28.5 to 29.5

*Field duplicate samples.

In May and June 2002 the vitrified mass was cored and sampled. Penetrating the glass in three locations and collecting seven discrete samples took approximately three weeks. A hollow-stem auger rig with a diamond-impregnated epoxy coring bit was used to collect most samples. The glass was extremely hard; consequently, several diamond bits were destroyed during the drilling effort. For two of the seven sample intervals, coring was very difficult and a tri-cone bit was used, which yielded chip samples rather than core.

The three boreholes within the vitrified mass (locations 21-02-19790, -19791, and -19792) were drilled along the long (east-west) axis of the melt (Figure 2.4-3). The first borehole was drilled near the melt center, approximately 2 ft from the thermocouple borehole. The other two boreholes were located 8 ft from each side of the thermocouple borehole. Each borehole was drilled from ground surface through the bottom of the vitrified mass. Borehole logs generated during the drilling effort indicate the top of the melt ranges in depth from 9 to 10.5 ft bgs; the bottom of the melt ranges in depth from 17.7 to 21.3 ft bgs (see Appendix B). Based on the four electrode depth measurements taken at the conclusion of the demonstration (28.0, 20.8, 26.0, and 29.4 ft bgs), melt thickness is variable near the corners of the vitrified mass (MSE 2001, 70157). The central area of the melt, as observed during drilling, is approximately 10 ft thick.

In the three boreholes drilled through the vitrified mass, gravel and crushed tuff fill were encountered in the top 9 to 10.5 ft bgs. Following this, a transitional zone of partially fused gravel, up to 2 ft thick, was encountered. When glass was encountered, drilling slowed. With the exceptions noted below, the core was a relatively homogeneous, dark gray glass up to 17.7 to 21.3 ft bgs, where a transition to unmelted tuff began. The presence of spherical metallic inclusions was noted throughout the glass in all three boreholes. These metallic beads usually were small (approximately 0.0625- to 0.125-in.-diameter), but a few larger beads (0.375-in.-diameter) were noted in deeper glass samples. A fractured zone was encountered from 16 to 17 ft bgs in the westernmost borehole (location 21-02-19792), and may have been the result of last-minute escape of gases from the melt. Appendix B contains logs for boreholes in the vitrified mass. Photos in Appendix G document the appearance of glass core, transitional zones, metallic inclusions, and fractured zones.

During drilling, glass core recovery ranged from 10% to 100% with an average of 85%. Sample intervals were selected from the recovered material to achieve representative coverage of the vitrified mass and all remaining core was archived at the Laboratory field support facility. Figure 2.4-3 shows the seven glass sample intervals chosen for analysis at a fixed laboratory. These samples were submitted for analysis for

TAL metals, TCLP metals, radionuclides by gamma spectroscopy, isotopic plutonium, isotopic uranium, strontium-90, and inorganic chemicals and radionuclides in PCT leachate (ASTM 1998, 64040). Although tritium was specified in the approved IM plan, it was not included in the analytical suite for the glass core because it was not expected to be present in samples that had experienced temperatures up to 2000°C (LANL 2000, 70037).

A number of mineralogical analyses were specified in the approved IM plan, including x-ray diffraction (XRD), optical microscopy, XRF, SEM, and EMPA (LANL 2000, 70037). XRD and optical microscopy were not conducted on the glass samples because no laboratory facilities were identified that could conduct the sample preparation and/or analysis on samples containing plutonium-239. However, the following mineralogical analyses were conducted:

- whole-rock analysis by XRF,
- EMPA analysis using wavelength dispersive spectroscopy (WDS),
- qualitative SEM analysis, and
- high-resolution photography (in lieu of optical mineralogy).

Of these analyses, the whole-rock data by XRF is the most important because the results are necessary, along with the PCT data, to evaluate the durability of the vitrified product. XRD, a method commonly used to identify crystalline substances, is the least useful method because homogeneous glass contains very few crystalline substances.

In sample intervals where recovery was low, there was not always sufficient sample volume remaining to conduct the mineralogical analyses. For two of the XRF and EMPA analyses, additional sample material was collected from the archived glass core. Because all data from this study indicate the glass is very homogeneous, the number of analyses conducted (at least four for each method) was adequate to characterize the mineralogy of the glass (see Section 2.5). Table 2.4-2 shows the samples that were evaluated for each mineralogical method.

Table 2.4-2
Mineralogical Analyses of NTISV Hot Demonstration Glass Samples, MDA V

Sample ID	Location ID	Depth (ft)	Whole-Rock Analysis by XRF	Qualitative SEM Analysis	EMPA/WDS	High-Resolution Photography
MD21-02-45850	21-02-19790	13–15	—[a]	x[b]	—	x
MD21-02-45851	21-02-19790	18–20	—	x	—	x
MD21-02-45852	21-02-19790	20–21	x	—	x	—
MD21-02-45853	21-02-19791	11–13	—	x	—	x
MD21-02-45854	21-02-19791	15–17	x	—	x	—
MD21-02-45856	21-02-19792	14–16	x	—	x	—
MD21-02-45857	21-02-19792	16–17.7	—	x	—	x
NTISV-1[c]	21-02-19790	15–18	x	—	x	—
NTISV-2[c]	21-02-19791	12.8–13	x	—	x	—

[a] — = Analysis has not been conducted on the sample.
[b] x = Analysis has been conducted on the sample.
[c] Samples collected from archived core.

During coring of the glass, one tuff sample was collected from the center borehole beneath the vitrified monolith (location 21-19790, 21 to 23 ft bgs). This sample was collected to determine if contamination from absorption bed 1 had been processed to an adequate depth during the hot demonstration. As with the pre- and postdemonstration boreholes, this tuff sample also was used to assess the potential for contaminant migration from the absorption beds during vitrification. This sample was analyzed for TAL metals, radionuclides (by gamma spectroscopy), isotopic plutonium, isotopic uranium, strontium-90, and tritium.

2.4.5 Site Restoration

Following the hot demonstration activities in April 2000, the site was restored to its predemonstration condition. Clean soil and gravel similar to the existing surface soils were placed over the sunken vitrified mass to accommodate the loss of void space volume. The surface was graded and seeded with native vegetation and the fencing was returned to predemonstration conditions.

Following the June 2002 drilling activities, additional site restoration was necessary. The three boreholes within the melt were surveyed and grouted. The site was hand-seeded with native vegetation and watered periodically until vegetation was established.

2.5 Hot Demonstration Sample Results

The complete analytical data set for all the hot demonstration samples is provided in Appendix D. Appendix C details the results of sample quality assurance/quality control (QA/QC) activities.

2.5.1 Absorption-Bed Sample Results

Eleven radionuclides were detected (or detected above BVs in the case of naturally occurring radionuclides) in the samples collected from the two absorption-bed trenches. Americium-241, cesium-137, cobalt-60, europium-152, plutonium-238 and -239, strontium-90, tritium, and uranium-234, -235, and -238 were all detected in these samples. The highest radionuclide concentrations generally occur in the 5 ft bgs gravel sample or the 7 ft bgs cobble sample from the distribution pipe location (21-11111). Table 2.5-1 gives the data for radionuclides in absorption bed 1.

Nine inorganic chemicals (antimony, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) were detected above BVs in the absorption-bed samples. At location 21-11111, the highest concentrations of these inorganic chemicals were in the 5-ft bgs gravel samples. At location 21-11112, the highest concentrations of these inorganic chemicals were in the 3-ft bgs crushed tuff sample. In no case was the highest concentration of any inorganic chemical detected above BV measured in the deepest (7-ft bgs) trench sample. Table 2.5-2 shows the data for inorganic chemicals that exceed BVs in absorption bed 1.

2.5.2 Pre- and Postdemonstration Borehole Sample Results

Analytical results from the pre- and postdemonstration boreholes were compared to determine if the vitrification process forced contaminants from the absorption beds into the adjacent tuff. Table D-2.0-1 in Appendix D presents all pre- and postdemonstration borehole data. Pre- and postdemonstration borehole data show no significant or consistent differences; these differences can be explained by normal Qbt 3 and/or analytical variability.

Table 2.5-1
Radionuclides Detected or >BVs in Absorption-Bed Samples, MDA V

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239	Strontium-90	Tritium	Uranium-234	Uranium-235	Uranium-238
Soil/Fill BV				**NA**[a]	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**2.59**	**0.2**	**2.29**
MD21-00-0001	21-11111	3.00	Fill	1.45	—[b]	0.26	—	0.51	81	—	7.14	39.8	2.13	23.2
MD21-00-0002	21-11111	5.00	Fill	12.9	0.99	—	1.25	17.2	2640	10.8	—	277	16.2	149
MD21-00-0003	21-11111	7.00	Fill	9.1	0.35	0.21	—	5.5	1570	12.1	27.6	144	7.7	86
MD21-00-0004	21-11112	3.00	Fill	—	—	—	—	—	0.83 (J)[c]	—	9.2	—	—	—
MD21-00-0005	21-11112	5.00	Fill	5.6	—	—	0.54	0.53	50.5		19.3	9.8	0.97	4.1
MD21-00-0006	21-11112	7.00	Fill	1.66	—	0.185	—	0.77	217	2.37	17.6	18	1	7.4

Note: Results reported in picocuries per gram.
[a] NA =BV is not available or not applicable.
[b] — =Analyte was not detected, or not detected above given BV.
[c] J = Sample result is estimated.

Table 2.5-2
Inorganic Chemicals >BVs in Absorption-Bed Samples, MDA V

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
Soil/Fill BV				**0.83**	**0.4**	**19.3**	**14.7**	**22.3**	**0.1**	**15.4**	**1**	**48.8**
MD21-00-0001	21-11111	3.00	Fill	—[a]	—	—	—	24	0.62 (J+)[b]	—	1.2 (J)	53
MD21-00-0002	21-11111	5.00	Fill	6.8 (J-)[c]	9.5	22 (J)[d]	93	82	8.1 (J+)	18	21 (J)	210
MD21-00-0003	21-11111	7.00	Fill	1.1 (J-)	0.62	—	16	—	1.3 (J+)	—	—	95
MD21-00-0004	21-11112	3.00	Fill	0.92 (J-)	—	—	37	—	0.24 (J+)	—	7.1 (J)	85
MD21-00-0005	21-11112	5.00	Fill	—	0.94	—	17	29	0.75 (J+)	—	—	69
MD21-00-0006	21-11112	7.00	Fill	—	—	—	—	—	0.75 (J+)	—	—	—

Note: Results reported in milligrams per kilogram.
[a] — =Analyte was not detected above the given BV.
[b] J+ =Sample result is estimated and biased high.
[c] J- =Sample result is estimated and biased low.
[d] J = Sample result is estimated.

Table 2.5-3 gives radionuclide data from pre- and postdemonstration samples. Cesium-134, cobalt-60, europium-253, plutonium-239, ruthenium-106, tritium, and uranium-235 and -238 were detected (or detected above BVs in the case of naturally occurring radionuclides) in predemonstration samples; only plutonium-238, -239, and tritium were detected in postdemonstration samples. The decrease in the number of radionuclides detected from pre- to postdemonstration samples probably is not related to the hot demonstration, but more likely is due to analytical and sample variability. However, these results indicate that contaminants have not migrated into surrounding tuff as a result of the high temperatures achieved during the demonstration.

Table 2.5-3
Radionuclides Detected or >BVs in Pre- and Postdemonstration Borehole Samples, MDA V

Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239	Ruthenium-106	Tritium	Uranium-235	Uranium-238
Qbt 2,3,4 BVs				**NA[a]**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0.09**	**1.93**
Predemonstration Samples												
MD21-00-0007	21-11113	11.00–12.50	Qbt 3	0.29	0.18	—[b]	—	0.72	—	—	—	—
MD21-00-0008	21-11113	11.00–12.50	Qbt 3	—	—	—	—	1.2	—	—	—	—
MD21-00-0009	21-11113	28.00–29.00	Qbt 3	—	—	—	—	—	—	1.79	—	—
MD21-00-0010	21-11114	11.00–12.00	Qbt 3	—	—	—	—	—	—	0.598	—	—
MD21-00-0011	21-11114	28.00–29.00	Qbt 3	—	—	—	—	—	3.4	1.13	0.103	8
MD21-00-0012	21-11115	11.00–12.00	Qbt 3	0.2	—	0.42	—	—	—	15	—	—
MD21-00-0013	21-11115	28.50–29.50	Qbt 3	—	—	0.62	—	—	—	1.08	—	—
Post-demonstration Samples												
MD21-00-0025	21-11158	11.01–12.51	Qbt 3	—	—	—	—	0.412	—	2.28 (J-)[c]	—	—
MD21-00-0026	21-11158	11.01–12.51	Qbt 3	—	—	—	—	0.65	—	2.12 (J-)	—	—
MD21-00-0027	21-11158	28.02–29.02	Qbt 3	—	—	—	—	—	—	2 (J-)		—
MD21-00-0028	21-11159	11.01–12.01	Qbt 3	—	—	—	—	—	—	0.303 (J-)	—	—
MD21-00-0029	21-11159	28.02–29.02	Qbt 3	—	—	—	—	—	—	0.438 (J-)	—	—
MD21-00-0030	21-11160	11.01–12.01	Qbt 3	—	—	—	—	—	—	4.15 (J-)	—	—
MD21-00-0031	21-11160	28.52–29.52	Qbt 3	—	—	—	—	—	—	1.1 (J-)	—	—
MD21-02-45859	21-02-19790	21.00–23.00	Qbt 3	—	—	—	0.0364	—	—	—	—	—

Note: Results reported in picocuries per gram.
[a] NA = BV is not available or not applicable.
[b] — = Analyte was not detected, or not detected above given BV.
[c] J- = Sample result is estimated and biased low.

Table 2.5-4 lists the inorganic chemical concentrations that exceeded Laboratory BVs in pre- and postdemonstration tuff samples. Chromium, nickel, and selenium were detected at concentrations above BVs in the predemonstration samples. Arsenic and nickel were detected above BVs in postdemonstration samples. The detection limits for antimony and selenium were above the BVs (Table 2.5-4). Differences between pre- and postdemonstration analytical results for tuff samples can be explained by analytical and sample variability but do not indicate migration of contaminants into the tuff.

Table 2.5-4
Inorganic Chemicals >BVs in Pre- and Postdemonstration Borehole Samples, MDA V

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Chromium	Nickel	Selenium
Qbt 2,3,4 BVs				**0.5**	**2.79**	**7.14**	**6.58**	**0.3**
Premelt Tuff Samples								
MD21-00-0007	21-11113	11.00–12.50	Qbt 3	—[a]	—	—	—	0.45 (J)[b]
MD21-00-0008	21-11113	11.00–12.50	Qbt 3	—	—	14 (J)	8.4	0.4 (U)[c]
MD21-00-0009	21-11113	28.00–29.00	Qbt 3	—	—	—	—	0.41 (U)
MD21-00-0010	21-11114	11.00–12.00	Qbt 3	—	—	—	—	0.4 (U)
MD21-00-0011	21-11114	28.00–29.00	Qbt 3	—	—	—	—	0.4 (U)
MD21-00-0012	21-11115	11.00–12.00	Qbt 3	—	—	—	—	0.4 (U)
MD21-00-0013	21-11115	28.50–29.50	Qbt 3	—	—	—	—	0.4 (U)
Post-Melt Samples								
MD21-00-0025	21-11158	11.01–12.51	Qbt 3	0.76 (UJ)[d]	—	—	—	0.36 (U)
MD21-00-0026	21-11158	11.01–12.51	Qbt 3	—	—	—	—	0.36 (U)
MD21-00-0027	21-11158	28.02–29.02	Qbt 3	0.59 (UJ)	—	—	—	0.37 (U)
MD21-00-0028	21-11159	11.01–12.01	Qbt 3	—	—	—	—	0.38 (U)
MD21-00-0029	21-11159	28.02–29.02	Qbt 3	—	—	—	—	0.37 (U)
MD21-00-0030	21-11160	11.01–12.01	Qbt 3	—	—	—	12	0.38 (U)
MD21-00-0031	21-11160	28.52–29.52	Qbt 3	—	—	—	—	0.38 (U)
MD21-02-45859	21-02-19790	21.00–23.00	Qbt 3	—	3.21	—	—	0.49 (U)

Note: Results reported in milligrams per kilogram.
[a] — = Analyte not detected above given BV.
[b] J = Sample result is estimated.
[c] U = Analyte not detected above the reported value.
[d] UJ =Analyte not detected and reported value is an estimate of the detection limit.

With the exception of tritium and mercury, inorganic chemicals and radionuclides present in the absorption-bed materials at MDA V are not volatile, and likely would not mobilize into the surrounding tuff during the vitrification process. Tritium, which is closely associated with water, was present in the absorption bed at concentrations ranging from 7.14 to 27.6 pCi/g prior to vitrification. Figure 2.5-1 presents pre- and postdemonstration data for tritium in tuff adjacent to the absorption bed. Mercury, a volatile metal detected in absorption-bed materials at concentrations ranging from 0.24 to 8.1 mg/kg, was not detected in any predemonstration samples. It was detected in only one postdemonstration sample, at a concentration near the analytical detection limit (0.0032 mg/kg). These data do not indicate tritium or mercury migration from absorption-bed materials into the adjacent tuff as a result of vitrification.

In addition to the pre- and postdemonstration tuff samples collected adjacent to the treatment area, one postdemonstration sample was collected from the tuff beneath the vitrified mass (21 to 23 ft bgs) in June 2002 (sample MD21-02-45859 from location 21-02-19790). Neither tritium nor mercury was detected in this sample. These data further support the conclusion that contamination did not migrate into surrounding tuff as a result of the hot demonstration.

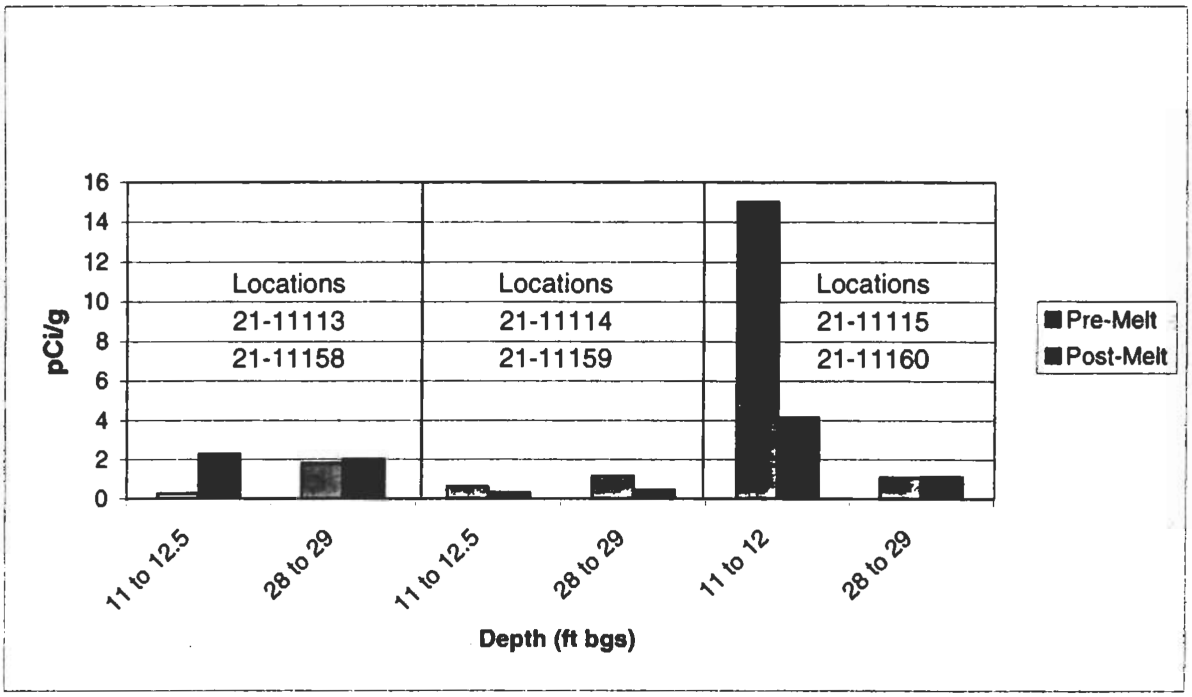

Figure 2.5-1. Tritium results for pre- and postdemonstration tuff samples collected adjacent to treatment area, MDA V

Tables 2.5-3 and 2.5-4 present data for radionuclides and inorganic chemicals that exceed Qbt 3 BVs for the sample collected beneath the tuff (MD21-02-45859) following the hot demonstration. Only four radionuclides were detected in the postdemonstration tuff sample collected beneath the melt: plutonium-238 and uranium-234, -235, and -238. Uranium isotopes, which occur naturally, were detected at concentrations less than BVs for Qbt 3, and therefore are not shown in Table 2.5-3 (Environmental Restoration Project 1998, 59730). Plutonium-238 was detected at 0.0364 pCi/g, compared to a previtrification maximum of 17.2 pCi/g in the absorption-bed materials. With the exception of arsenic, inorganic chemical concentrations detected in this sample were below the Qbt 3 BVs. The detection limit for selenium exceeded the Qbt 3 BV (Table 2.5-4). Although no analogous predemonstration sample was collected beneath absorption bed 1, the lack of significant contamination in the postdemonstration sample indicates the hot demonstration successfully treated the vertical extent of contamination that resulted from wastewater disposal at MDA V.

2.5.3 Vitrified Mass Sample Results

2.5.3.1 Glass Chemistry

Seven glass samples collected from the three boreholes (Figure 2.4-3) were submitted for analysis for TAL metals, radionuclides, TCLP metals, and PCT. The complete data set is provided in Appendix D, and the results of QA/QC activities are presented in Appendix C.

The only inorganic chemical detected in the melt at concentrations exceeding its BV was silver, which was detected in three of the seven glass samples at concentrations ranging from 1.23 to 2.8 mg/kg. Six radionuclides were detected in the glass samples: americium-241, plutonium-238 and -239, and uranium-234, -235, and -238. Table 2.5-5 lists radionuclide data for the glass samples.

Table 2.5-5
Radionuclides Detected or Detected Above BVs in Hot Demonstration Glass Samples, MDA V

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Soil/Fill BV				**NA**[a]	**NA**	**NA**	**2.59**	**0.2**	**2.29**
MD21-02-45850	21-02-19790	13.00–15.00	Fill	3.17	0.974	130	10.4	0.529	6.49
MD21-02-45851	21-02-19790	18.00–20.00	Fill	2.56	0.897	109	10.1	0.664	6.28
MD21-02-45852	21-02-19790	20.00–21.00	Fill	—[b]	0.0248	—	1.09	0.105	1.13
MD21-02-45853	21-02-19791	11.00–13.00	Fill	2.73	0.766	119	10.3	0.484	6.15
MD21-02-45854	21-02-19791	15.00–17.00	Fill	2.84	0.825	124	11	0.5	6.74
MD21-02-45856	21-02-19792	14.00–16.00	Fill	2.65	0.785	107	9.07	0.74	5.99
MD21-02-45857	21-02-19792	16.00–17.70	Fill	—	0.0322	0.0885	1.25	—	1.31

Note: Results reported in picocuries per gram.
[a] n/a = BV is not available or not applicable.
[b] — = Radionuclide not detected, or not detected above given BV.

Comparing analytical results from absorption-bed samples with those from glass samples show contaminants were homogenized throughout the melt due to convective mixing during vitrification. In particular, radionuclide concentrations are uniform throughout the vitrified mass. Two glass samples tended to have significantly lower or undetected concentrations of radionuclides. These samples were collected from the bottom of the vitrified mass in boreholes 21-02-19790 and -19792, and may have been from an area that originally had lower levels of contamination and were not subjected to convection due to their location at the edge of the melt. Figure 2.5-2 shows the range of contaminant values in the treatment area before and after vitrification for the most prevalent radionuclides. The range of concentrations observed in the postdemonstration glass samples is much narrower than that of the predemonstration absorption-bed samples. In addition, the maximum radionuclide concentrations measured in the glass samples are roughly 1 order of magnitude less than those measured in the absorption-bed samples. The box area of the plot is the region between the 25th and 75th percentiles of the data. The horizontal line within the box represents the median (50th percentile) of the data. Crosses represent individual detections and open circles represent nondetected data, reported as the detection limit.

2.5.3.2 TCLP Results

TCLP data were evaluated to determine the potential for metals to leach from the glass and to evaluate the landfill behavior of the vitrified product. All TCLP results are given in Appendix D. Of the eight TCLP metals evaluated (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), only barium was detected consistently in TCLP leachate samples. Barium concentrations in the leachate ranged from 22 to 45 µg/L, roughly 3 orders of magnitude below the EPA's universal treatment standard (UTS) of 21,000 µg/L for barium. Low chromium levels were detected in two samples, which coincided with the only two depth intervals drilled with a tri-cone bit (sample IDs MD21-02-45854 and -45856). Chromium detects (55.1 and 66.6 µg/L) may be an artifact of the drilling method. These values are 1 order of magnitude below the chromium UTS of 600 µg/L. TCLP results suggest the glass is durable and resistant to leaching.

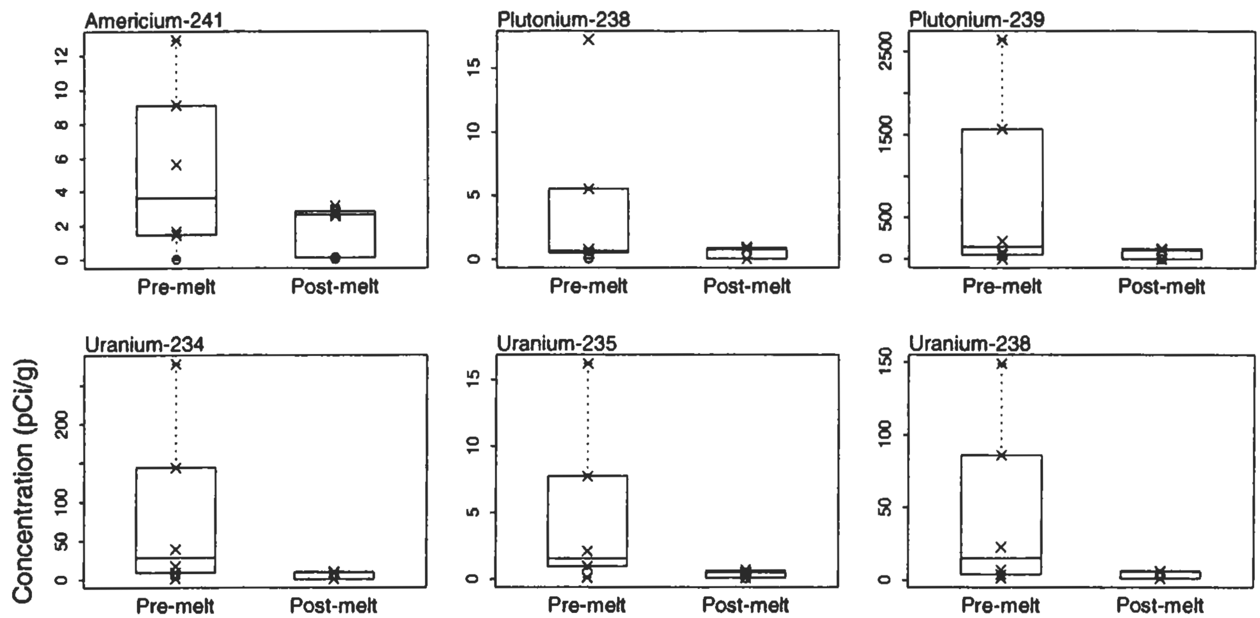

Figure 2.5-2. Comparison of radionuclides in absorption-bed materials (pre-melt) and in vitrified glass (post-melt), MDA V

2.5.3.3 Whole-Rock by XRF Analysis

Table 2.5-6 presents the results of whole-rock analysis by XRF, performed on selected glass samples. Due to insufficient sample volumes from the originally sampled glass core intervals, core that had been archived was sampled to produce two additional samples for XRF analysis.

Table 2.5-6
Whole-Rock Data for Glass Samples, MDA V

Sample ID	Location ID	Depth (ft bgs)	SiO_2 (wt %)	TiO_2 (wt %)	Al_2O_3 (wt %)	Fe_2O_3 (wt %)	MnO (wt %)	MgO (wt %)	CaO (wt %)	Na_2O (wt %)	K_2O (wt %)	P_2O_5 (wt %)	BaO (wt %)
MD21-02-45852	21-02-19790	20–21	76.31	0.20	11.82	2.65	0.05	0.40	1.16	3.60	3.71	0.07	0.03
MD21-02-45854	21-02-19791	15–17	77.13	0.21	11.91	1.49	0.05	0.40	1.26	3.66	3.80	0.05	0.03
MD21-02-45856	21-02-19792	14–16	76.58	0.20	11.92	2.07	0.05	0.37	1.13	3.71	3.81	0.12	0.03
NTISV-1[a]	21-02-19790	15–18	77.21	0.21	11.83	1.49	0.05	0.43	1.25	3.71	3.71	0.07	0.03
NTISV-2[a]	21-02-19791	12.8–13	76.91	0.23	11.92	1.72	0.05	0.43	1.28	3.60	3.76	0.05	0.04
NTISV-2[a,b]	21-02-19791	12.8–13	77.11	0.21	11.97	1.52	0.05	0.43	1.26	3.60	3.76	0.05	0.03

Note: Results normalized to 100%.

[a] Samples collected from archived core.

[b] Duplicate analysis.

Whole-rock data by XRF analysis had very good recovery, with totals ≥99.7% before the data were normalized to 100%. These high recoveries indicate the major elements listed in Table 2.5-6 account for virtually all nontrace level glass constituents. Loss-on-ignition, which measures moisture and combustible constituents, was low (0.01%), as would be expected for samples that have been subjected to temperatures up to 2000°C.

With the exception of iron oxide, whole-rock results were homogeneous throughout the melt. Due to the presence of iron inclusions in some glass samples, the iron oxide data were more variable than the other major elements measured in the whole-rock analysis.

2.5.3.4 PCT Results

The primary goal of vitrifying radioactive waste is to immobilize the radionuclides within a highly durable glass. One method used to evaluate the durability of high level waste glass is the ASTM PCT extraction procedure, which is performed by leaching a crushed sample of vitrified product with 90°C de-ionized water for seven days (ASTM 1998, 64040). The leachate then is analyzed for major glass-forming elements and compared to the total amount of those elements in the glass, obtained by whole-rock analysis. Calculations are performed to normalize the concentrations of the elements in the leachate with respect to the composition and surface area of the glass. These normalized release rates allow comparisons to the performance of other waste glasses. Normalized release rates are calculated by dividing the total amount of an element in the PCT leachate by the total amount in the crushed sample (from whole-rock data) and factoring in the surface area per unit mass of the sample. The final normalized release values are expressed in g/m^2 (grams of element released per square meter of sample surface area).

Although the NTISV hot-demonstration glass is not a high-level waste, PCT analysis was conducted because it is the most appropriate way to assess the durability of waste glass. Seven glass samples, each run in triplicate, were subjected to PCT analysis. The PCT data for all samples, including the duplicate and triplicate samples, are presented in Appendix D and QA/QC results are presented in Appendix C. Table 2.5-7 provides the normalized release rates for the three samples that underwent both PCT and whole-rock analysis (i.e., the three samples for which it was possible to calculate normalized release rates).

Table 2.5-7
Normalized PCT Release Rates for Hot Demonstration Glass, MDA V

	Normalized Release Rates (g/m^2)			
Element	**MD21-02-45852**	**MD21-02-45854**	**MD21-02-45856**	**EA Glass[a]**
Aluminum	0.0508	0.0167	0.0130	—[b]
Barium	0.0080	0.0011	0.0036	—
Calcium	0.0010	0.2019	0.2476	—
Iron	0.0040	0.0029	0.0033	—
Magnesium	0.0183	0.0009	0.0070	—
Potassium	0.0082	0.0029	0.0053	—
Silicon	0.0090	0.0064	0.0072	1.96
Sodium	0.1481	0.0777	0.0971	6.46

[a] Normalized release rates for environmental assessment (EA) glass represent the DOE acceptance criteria for high-level waste glass.
[b] — = No acceptance criteria available for these elements.

DOE defines the acceptance criteria for high-level waste glass on the basis of releases measured using PCT extraction on environmental assessment (EA) glass (available at http://www.em.doe.gov/waps/index.html). Releases of sodium, boron, and lithium are the indicators used to evaluate borosilicate glass quality. Glass from the NTISV hot demonstration is not a borosilicate glass and does not contain enough boron or lithium to facilitate evaluation of these elements using PCT. However, the NTISV glass does contain enough sodium to conduct an evaluation. Additional analysis for silicon showed the release rate for silicon from EA glass was 1.96 g/m^2 (McGlinn et al. 1998, 76098). Both sodium and silicon release rates are good indicators of glass quality and can be used to evaluate NTISV product durability. Table 2.5-7 shows the normalized release rates for sodium and silicon in the hot demonstration glass are at least an order of magnitude lower than those for the EA glass on which the DOE acceptance criteria are based.

In addition to the major glass-forming elements, the PCT leachate also was analyzed for radionuclides. Uranium-234 and -238 were detected at low concentrations in three of the seven glass samples. However, radionuclide detections could not be reproduced in any corresponding duplicate or triplicate samples. No other radionuclides were detected in the PCT leachate, and none was present in the glass at high enough concentrations to be detected by whole-rock analysis. Therefore, it was not possible to evaluate the PCT data with respect to radionuclides.

2.5.3.5 SEM and EMPA

SEM and EMPA are similar imaging and analytical methods that use the interaction between the sample and a beam of electrons to produce information. Four glass samples (MD21-02-45850, -45851, -45853, and -45857) were evaluated using Laboratory SEM facilities. Five additional glass samples, including two from the archived core, were subjected to EMPA at the University of Washington.

Although a different subset of samples was submitted to each facility and different instruments were used, the images obtained are very similar. Both the SEM and EMPA images show homogeneous glass, spherical metal inclusions, and small, needle-shaped crystals. Figure 2.5-3 shows two images, one from SEM and one from EMPA, of the glass and metal inclusions. Additional SEM and EMPA images are included in Appendix G.

In addition to imaging, WDS analysis was conducted at the University of Washington to obtain a semiquantitative evaluation of the glass composition. Table 2.5-8 shows the results of the WDS analysis, normalized to 100%. The data agree very well with the whole-rock data, obtained by XRF, reported in Section 2.5.3.3.

WDS also was used to identify the composition of various features identified in the images. Through WDS analysis, the spherical inclusions were determined to be composed of iron, the needle-shaped crystals found within some portions of the metal are calcium- and magnesium-rich (possibly pyroxenes), and the darker phases associated with the iron inclusions are phosphates and phosphides. These phosphates and phosphides may have originated from detergents, although detergent use at the DP laundry facility is not documented. These darker phases can be seen within and around the edges of the iron inclusions shown in Figure 2.5-3.

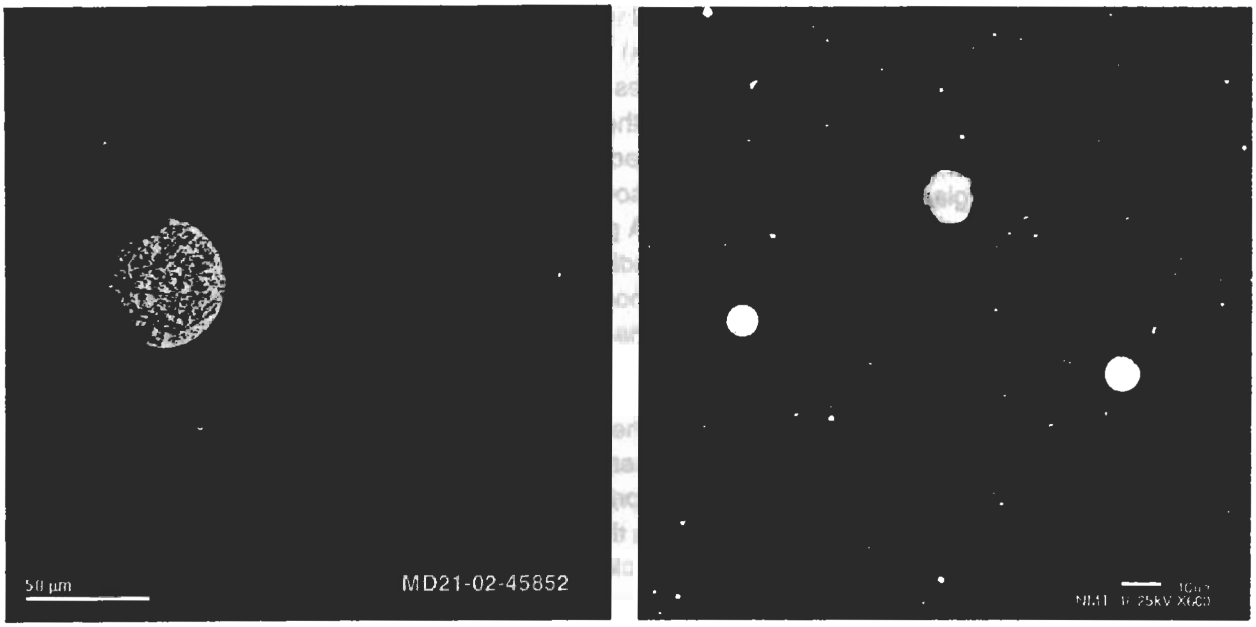

Figure 2.5-3. EMPA (L) and SEM (R) images of metal inclusions and homogeneous dark gray glass, MDA V

Table 2.5-8
Normalized Chemistry from Wavelength Dispersive Spectroscopy Analysis, MDA V

Oxide (wt %)	Sample ID				
	MD21-02-45852	**MD21-02-45854**	**MD21-02-45856**	**NTISV-1***	**NTISV-2***
SiO_2	78.13	77.72	77.47	77.95	77.27
TiO_2	0.21	0.23	0.18	0.24	0.30
Al_2O_3	12.07	12.03	12.45	12.13	12.14
FeO	0.50	0.62	1.01	0.64	0.79
MnO	0.03	0.35	0.06	0.08	0.08
MgO	0.45	0.49	0.34	0.46	0.46
CaO	1.09	1.20	1.08	1.15	1.23
BaO	0.06	0.04	0.07	0.04	0.05
Na_2O	3.60	3.43	3.34	3.44	3.68
K_2O	3.86	3.90	4.01	3.87	4.00

*Samples collected from archived core.

2.5.3.6 High-Resolution Photographs

In addition to the SEM and EMPA imaging, high-resolution color photographs (magnification of 100x to 1000x) were taken of four of the glass samples (MD21-02-45850, -45851, -45853, and -45857) that show features very similar to the SEM and EMPA images. These photographs were taken in lieu of the optical mineralogy specified in the IM plan (LANL 1999, 70037). Optical mineralogy requires a "thin section" (a highly polished sample of specific thickness mounted on a glass slide), and no facility was identified that could create a thin section of samples containing plutonium. Figure 2.5-4 shows a typical high-resolution photograph of the glass features. Additional high-resolution photographs are included in Appendix G.

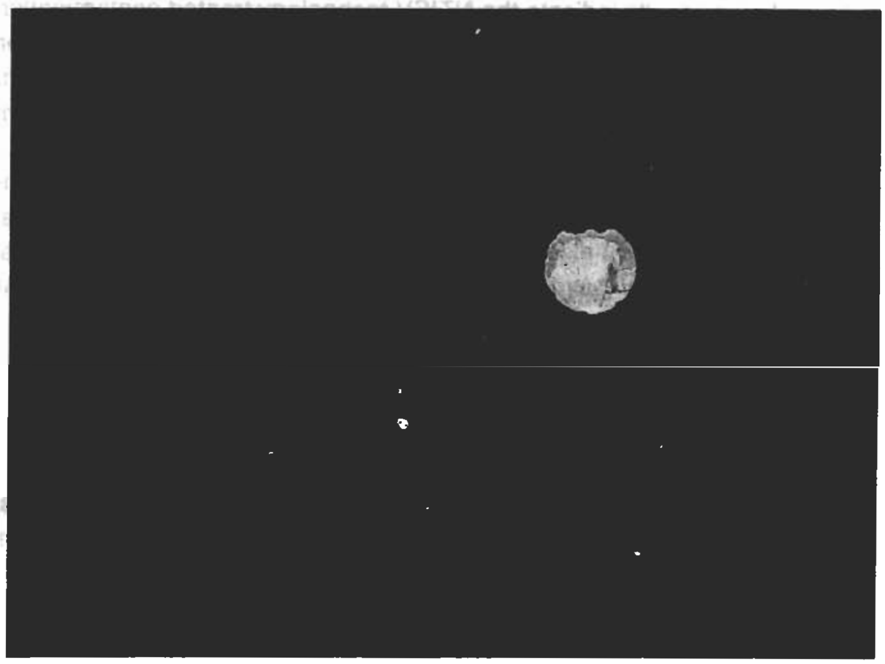

Figure 2.5-4. High-resolution photograph of sample MD21-02-45850 showing metal inclusions and homogeneous dark gray glass, MDA V

2.6 Conclusions

The NTISV hot demonstration at MDA V resulted in an approximately 6000-cu-ft (222-cu-yd) vitrified mass that is approximately 20 x 30 x 10 ft thick. Assuming a volume reduction of 35%, the original volume of the treated material was approximately 342 cu yd; based on data from the surrounding tuff, this treatment volume was sufficient to process the contamination in the targeted treatment area.

Analysis of the glass samples indicated the glass is homogeneous due to convective mixing that occurred during melting. Radionuclide concentrations in the glass were very consistent, and were more than an order of magnitude below maximum concentrations measured in premelt absorption-bed samples. Whole-rock data obtained by XRF also showed the glass is homogeneous and agreed with the findings of the WDS analysis. Images of the glass obtained by SEM, EMPA, and high-resolution photography further indicated the glass is homogeneous. Regardless of the sample or method, the same features were seen in many of the images.

Based on PCT and TCLP results, the hot demonstration glass is durable and resistant to leaching. All PCT results met performance standards set for waste glass by the DOE and all TCLP results met the UTSs set by EPA.

Prior to the hot demonstration, air emissions were estimated for radionuclides and metals to determine if any pre-approval, monitoring, or permitting requirements applied. The results of air monitoring for radionuclides and metals during the vitrification process confirmed the results and conclusions based on the original estimates, which were that no preapproval, monitoring, or permitting was necessary. Oxygen, carbon dioxide, and carbon monoxide emissions measured at the thermal oxidizer were similar to other combustion sources, such as automobiles.

All sampling and monitoring results indicate the NTISV technology treated contamination at MDA V effectively and all demonstration objectives were met. However, based on information presented in Appendix E, this demonstration cost approximately of $3700/cu yd (excluding characterization, reporting, and management activities). Although some of this unit cost results from the small volume of material processed and significant savings could be expected from a full-scale NTISV operation, this technology is expected to be less cost-effective than a conventional removal action with disposal of the absorption-bed materials as low-level radioactive waste. If absorption-bed materials at MDA V were characterized as mixed waste, NTISV technology may be considered cost-effective. Other factors, such as waste minimization and worker safety, also should be considered when optimal treatment technology for a given site is determined.

3.0 WASTE MANAGEMENT

All wastes generated during the NTISV hot demonstration were stored and managed in accordance with a site-specific waste management plan and all applicable local, state, and federal regulations. Wastes generated during NTISV hot demonstration activities included investigation-derived waste (IDW) contact wastes consisting of personal protective equipment, disposable sampling equipment, and plastic sheeting; decontamination water; scrubber water; municipal refuse; starter-path solution mixed with soil; used HEPA filters; air filters from the track drill; and spent aerosol cans.

Based on waste characterization results, approximately 1600 gal. of scrubber water and decontamination wash water were disposed of at the Radioactive Liquid Waste Treatment Facility at TA-50. The starter-path solution mixed with soil was solidified and disposed of at Area G, TA-54. IDW contact waste was disposed of as low-level waste at Area G, TA-54. The municipal refuse was disposed of at the Los Alamos County landfill. All remaining waste streams were transported to TA-54 for disposal at a permitted off-site treatment storage and disposal facility.

4.0 REFERENCES

The following list includes all documents cited in the body of this report. Parenthetical information following each reference provides the author, publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the RRES-RS Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the RRES-RS project reference library titled "Reference Set for Material Disposal Areas, Technical Area 21."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Area Office; US Environmental Protection Agency, Region 6; and RRES-RS. This library is a living collection of documents that was developed to ensure that the administrative authority has all material needed to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

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Appendix A

Acronyms, Glossary, and Conversion Table

Acronyms

AOC	area of concern
ASTM	American Society for Testing and Measurement
ATI	Analytical Technologies, Inc.
bgs	below ground surface
BMP	best management practice
BV	background value
COPC	chemical of potential concern
CRDL	contract-required detection limit
DOE	US Department of Energy
dpm	disintegrations per minute
EA	environmental assessment
EMPA	electron microprobe analysis
EPA	US Environmental Protection Agency
ER	environmental restoration
ER ID	Environmental Restoration identification record (number)
FY	fiscal year
HEPA	high energy particulate in air
HRMB	Hazardous and Radioactive Materials Bureau
HSWA	Hazardous and Solid Waste Amendments of 1984
IDW	investigation-derived waste
IM	interim measure
ISV	in situ vitrification
LCS	laboratory control samples
LOI	loss-on-ignition
MDA	material disposal area
MDA	minimum detectable activity
MDL	method detection limit
MLE	most likely exposure
NMED	New Mexico Environment Department
NTISV	nontraditional in situ vitrification
PCT	product consistency test
PQL	practical quantitation limit
QA	quality assurance

QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RME	reasonable maximum exposure
RPD	relative percent difference
RPF	Records Processing Facility
RRES-RS	Risk Reduction and Environmental Stewardship-Remediation Services
SAL	screening action level
SEM	scanning electron microscopy
SOP	standard operating plan
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
TD	total depth
TPU	total propagated uncertainty
UTL	upper tolerance limit
UTS	uniform treatment standard
VCM	voluntary corrective measure
wt %	weight percent
WDS	wavelength dispersive spectroscopy
XRD	x-ray diffraction
XRF	x-ray fluorescence

Glossary

chemical of potential concern (COPC)—Chemical, detected at a site, that has the potential to adversely affect human receptors due to its concentration, distribution, and mechanism of toxicity. A COPC remains a concern until exposure pathways and receptors are evaluated in a site-specific human health risk assessment.

contaminant—Any chemical (including radionuclides) present in environmental media or on structural debris.

curie—Unit of radioactivity defined as the quantity of any radioactive nuclide that has an activity of 3.7 ´ 1010 disintegrations per second (dps).

electron microprobe analysis (EMPA)—an analytical method that uses a focused beam of high-energy electrons to non-destructively analyze a sample. The high-energy electrons induce emissions of characteristic x-rays.

gamma radiation—A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding, such as concrete or steel, to be blocked.

groundwater—Water in a subsurface saturated zone; water beneath the regional water table.

migration—Movement of inorganic and organic species through unsaturated or saturated materials.

monolith—Single massive structure.

potential release site (PRS)—Refers to potentially contaminated sites at the Laboratory that are identified either as solid waste management units (SWMUs) or areas of concern (AOCs). PRS refers to SWMUs and AOCs collectively.

radiation—Energy emitted in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

radionuclide—Nuclide (species of atom) that exhibits radioactivity.

RCRA facility investigation (RFI)—Investigation that determines if a release has occurred and the nature and extent of the contamination at a hazardous waste facility. The RFI is generally equivalent to the remedial investigation portion of the Comprehensive Environment, Response, Compensation, and Liability Act (CERCLA) process.

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles that contain any hazardous wastes or hazardous constituents).

Resource Conservation and Recovery Act (RCRA)—Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976. (40 CFR 270.2)

sample—Portion of a material (e.g., rock, soil, water, air), which, alone or in combination with other samples, is expected to be representative of the material or area from which it is taken. Samples are typically sent to a laboratory for analysis or inspection or are analyzed in the field. When referring to samples of environmental media, the term field sample may be used.

scanning electron microscopy (SEM)—Analytical method that uses a beam of focused electrons to scan the surface of an object. The electrons scattered and the secondary electrons produced by the object are collected to form a three-dimensional image of the object.

screening action level (SAL)—Medium-specific concentration level for a chemical derived using conservative criteria below for which it is generally assumed that there is no potential for unacceptable risk to human health. The derivation of a SAL is based on conservative exposure and land-use assumptions. However, if an applicable regulatory standard exists that is less than the value derived by risk-based computations, it will be used for the SAL.

sediment—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice; or a mass that is accumulated by any other natural agent and that forms in layers on the earth's surface such as sand, gravel, silt, mud, fill, or loess. (2) A solid material that is not in solution and either is distributed through the liquid or has settled out of the liquid.

solid waste management unit (SWMU)—Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated units (i.e., landfills, surface impoundments, waste piles, and land treatment units) but does not include passive leakage or one-time spills from production areas and units in which wastes have not been managed (e.g., product-storage areas).

technical area (TA)—The Laboratory established technical areas as administrative units for all its operations. There are currently 49 active TAs spread over 40 square miles.

total propagated uncertainty (TPU)—Range of concentrations (expressed as plus or minus the measured concentration) that include the theoretical or true concentration of an analyte with a specific degree of confidence. Radiochemical results are required to be accompanied by sample-specific uncertainty bounds (TPU) that reflect the 67% confidence level (1-sigma TPU). The TPU includes not only the measurement or counting error but also the technique-specific error term that includes uncertainty values for each contributing measurement process and a sample-specific contribution reflecting specific chemical recoveries, detectors used, etc. All radiochemical result uncertainties incorporate terms for technique-related and sample-specific measurement errors.

tuff—Compacted deposit of volcanic ash and dust that contains rock and mineral fragments accumulated during an eruption.

US Department of Energy (DOE)—Federal agency that sponsors energy research and regulates nuclear materials for weapons production.

US Environmental Protection Agency (EPA)—Federal agency responsible for enforcing environmental laws. While state regulatory agencies may be authorized to administer some of this responsibility, the EPA retains oversight authority to ensure protection of human health and the environment.

vitrification—Act of converting something into a glass or glassy substance by heat and fusion.

x-ray diffraction—Analytical method that uses the scattering of x-rays by the crystalline structure of a material to determine the nature or identity of the material.

Metric to US Customary Unit Conversions

Multiply SI (Metric) Unit	by	To Obtain US 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)

Appendix B

Borehole Logs

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11113	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 2/14/2000	END DATE: 2/14/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Anaytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5'/2.5'			FILL: 0 to 3.8 ft.: Brown crushed tuff fill used to build pad. 3.8 to 4.3 ft: Moderate Brown (5YR 4/4) fine to very fine grained sandy silt with crushed tuff fragments (Fill material). 4.3 to 4.6 ft: Gray, (N8) crushed tuff fill material.		
	2.0'/2.5'					
5	2.5'/2.5'			SAND: 4.6 to 7.5 ft: Moderate brown (5YR 4/4), Poorly sorted silty very fine sand and gravel. Grades to clayey very fine sand at bottom of interval. Firm, slightly moist slightly plastic.		
	2.5'/2.5'					
10	2.5'/2.5'	MD21-00-0007 (11.0'-12.5') MD21-00-0008 (11.0'-12.5'). Duplicate.	alpha, beta/gamma = NDA	TUFF: 7.5 to 30.0 ft: Gray, (N 7.5), non-welded, moderately indurated tuff. Pumice are not flattened, but phenocrysts to about 2.0 mm.		10': Fracture with rootlets. No staining or discoloration associated with the fracture. (~1-2 mm)
	2.5'/2.5'					
15	2.5'/2.5'					
	2.5'/2.5'					
20	2.5'/2.5'					
	2.5'/2.5'					
25	2.5'/2.5'					
30	2.5'/2.5'	MD21-00-0009 (28.0'-29.0')	alpha, beta/gamma = NDA			1505 hrs: backfilled hole

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11114	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 2/14/2000	END DATE: 2/15/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Anaytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5'/2.5'			FILL: 0 to 4.0 ft: Crushed tuff fill used to construct pad.		
	2.5'/2.5'			FILL: 4.0 to 7.0 ft: fill material. Moderate brown (5YR 5/5), Silty very fine sand over gray (N8) crushed tuff over clayey silt and and sand and < 5% gravel. Gravel to 2.5 cm. Very firm at top of interval. Becomes slightly plastic at 6.5 to 7.0 ft, slightly moist.		
5	2.5'/2.5'					
	2.5'/2.5'					
10	2.5'/2.5'	MD21-00-0010 (11.0'-12.0')	alpha, beta/gamma = NA	TUFF: 7.0 to 30.0 ft: Gray, (N 7.5) , non-welded, moderately indurated tuff. Pumice are not flattened, but are discolored/altered to a light brown (5YR 5.5/5). Prominant quartz phenocrysts to about 2.0 mm. Sanidine phenocrysts to 2.0 mm <5%.		
	2.5'/2.5'					2/14/2000, 1645 hrs: End days drilling at 15 ft (bgs). Will pull 15 to 20 ft run in morning.
15	5.0'/5.0'					
20	2.5'/2.5'					2/15/2000, 0740 hrs: Resume drilling. Pulling 15 to 20 ft run.
	2.5'/2.5'					0830 hrs: TD at 30 ft (bgs).
25	2.5'/2.5'					Backfilling borehole with cuttings and cementing upper 2 ft of borehole.
	2.5'/2.5'	MD21-00-0011 (28.0' -29.0')	alpha, beta/gamma = NA			
30						

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11115	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 2/15/2000	END DATE: 2/15/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Anaytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5'/2.5'			FILL: Brown crushed tuff fill used to build pad.		
	2.5'/2.5'					
5	2.5'/2.5'			FILL: Moderate brown (5yr 5/5) silty very fine sandover gray (N8) crushed tuff over silty to clayey very fine sand and gravel. Clasts to 3 cm. Soft, very slightly moist and loose at the top of the interval to firm and slightly plastic at bottom of interval.		
	2.5'/2.5'					
10	2.5'/2.5'	MD21-00-0012 (11.0'-12.0')	alpha, beta/gamma = NA	TUFF: Gray (N8) Tuff. Non-welded. Moderately indurated to well indurated. Pumice are not flattened. Pumice are light brown (5 YR 5.5/5). Quartz phenocrysts to 2 mm. Sanidine phenocrysts < 5% to 2 mm.		10 ft to 12.5 ft: High angle fracture with CaCo3. (1-2mm).
15	2.5'/2.5'					
	5.0'/5.0'					
20	3.5'/3.5'					
25	3.5'/4.0'					1030 hrs: backfilled hole with cuttings and cemented the upper 2 ft of borehole.
	2.5'/2.5'	MD21-00-0013 (28.5'-29.5')	alpha, beta/gamma = NA			
30						

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11158	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 5/1/2000	END DATE: 5/1/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Anaytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	1.25'/2.5'		alpha, beta/gamma = NDA	FILL: Crushed tuff fill used to construct pad.		2 ft West of 21-11113.
5	2.5'/2.5'		alpha, beta/gamma = NDA	FILL: Gray (N8) crushed tuff. Dry, soft and loose. FILL: Moderate brown (5YR 4/4) silty very fine sand and gravel that grades to clayey silt sand and gravel. Dry, soft and loose at top to slightly moist, firm and slightly plastic.		
	1.0'/2.5'		alpha, beta/gamma = NDA			
10	2.5'/2.5'		alpha, beta/gamma = NDA	TUFF: Gray (N 7.5 - N8) tuff. Non-welded. Poorly to well indurated. Becomes strongly indurated at 17.5 ft to TD. Prominent phenocrysts of sanidine and quartz. Pumice are as large as 4 cm and altered reddish brown.		Hot to touch. Low angle fracture with silt fill (1-2 mm).
	2.5'/2.5'	MD21-99-0025 and MD21-99-0026 (11.0'-12.5')	alpha, beta/gamma = NDA			
15	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
20	2.5'/2.5'		alpha, beta/gamma = NDA			Core very well indurated.
	2.5'/2.5'		alpha, beta/gamma = NDA			
25	2.5'/2.5'		alpha, beta/gamma = NDA			Sharp drop in temperature of core at 25 ft.
	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'	MD21-99-0027 (28.0' 29.0')	alpha, beta/gamma = NDA			
30						

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11159	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 5/1/2000	END DATE: 5/1/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Anaytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	1.0'/2.5'		alpha, beta/gamma = NDA	FILL: Silty fine sand and crushed tuff fill. Reddish brown (5 YR 5/5). Soft, loose and slightly moist.		2 ft West of 21-11114.
	2.5'/2.5'		alpha, beta/gamma = NDA	FILL: White (N8) crushed tuff fill. Dry to slightly moist.		
5	2.0'/2.5'		alpha, beta/gamma = NDA	FILL: Silt sand angular gravel and large fragments of tuff (fill). Soft, slightly moist and loose at top of interval. Grades to firm, slightly moist, slightly plastic clayey silt, sand and gravel at bottom of interval.		
	3.0'/2.5'		alpha, beta/gamma = NDA	TUFF: Gray (N 7.5 - N8) tuff. Non-welded. Poorly indurated at top of interval. Becomes strongly indurated at 18 ft to TD. Prominent phenocrysts of sanidine and quartz. Pumice are as large as 2.5 cm and altered reddish brown.		
10	2.0'/2.5'	MD21-99-0025 and MD21-99-0028 (11.0'-12.0')	alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
15	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
20	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
25	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'	MD21-99-0029 (28.0' - 29.0')	alpha, beta/gamma = NDA			
30						

LOS ALAMOS NATIONAL LABORATORY
NTISV Hot Demonstration
ENVIRONMENTAL RESTORATION, MDA Focus Area
BOREHOLE LOG

BOREHOLE ID 21-11160	TA/OU: TA-21	Page 1 of 1
TOTAL DEPTH: 30 ft (bgs)	START DATE: 5/1/2000	END DATE: 5/1/2000
DRILLING EQ/METHOD: CME 750 / 4.25" (ID) HSA	SAMPLING EQ/METHOD: Core barrel/Continuous Core	
DRILLING COMPANY: Stewart Bros.	BOREHOLE ORIENTATION: Vertical	
DRILLER: S. Johnson	SITE GEOLOGIST: J. Crocker	

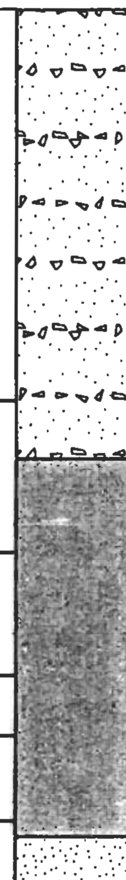
Depth (ft)	Core Run (amt.-recov./amt. attemp.)	Analytical Sample Number (Depth interval)	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5'/2.5'		alpha, beta/gamma = NDA	FILL: Silty very fine sand and crushed tuff fill. Reddish brown (5 YR 5/5). Soft, loose and very slightly moist.		2 ft West of 21-11115.
				FILL: Grey (N8) crushed tuff fill. Dry soft and loose.		
	2.5'/2.5'		alpha, beta/gamma = NDA	FILL: Reddish brown (5YR 5/5), clayey silt and gravel fill. Becomes silty clay and gravel at bottom. Slightly moist, firm and very slightly plastic to moist, firm and plastic at bottom of interval.		
5	2.5'/2.5'		alpha, beta/gamma = NDA	TUFF: Gray (N8), non-welded, poorly to well indurated tuff. Induration increases with depth. Large prominant phenocrysts of sanidine and quartz. Pumice are white and unaltered to reddish brown and devitrified and as large as 4 cm.		
	2.5'/2.5'		alpha, beta/gamma = NDA			
10	2.5'/2.5'	MD21-99-0030 (10.0'-11.0')	alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
15	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
20	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'		alpha, beta/gamma = NDA			
25	2.5'/2.5'		alpha, beta/gamma = NDA			
	2.5'/2.5'	MD21-99-0031 (27.5' -28.5')	alpha, beta/gamma = NDA			
30						

BOREHOLE ID: 21-02-19790	PROJECT: MDA-V Absorption Bed #1, TA-21	DATE: 5/29/02 - 6/5/02
TOTAL DEPTH: 23 ft bgs	BOREHOLE DIAMETER: 10 in. auger w/ 3 in. core	BOREHOLE ORIENTATION Vertical
DRILLING COMPANY: Kleinfelder	DRILLING METHOD: HSA rotary core w/ air	DRILLER: Rob Helton GEOLOGIST: Tom Benson

DEPTH (ft asl)	CORE RUN	FOOTAGE INTERVAL (ft)	DRILLED/ RECOVERED (ft)	DRILL CORE DESCRIPTIONS	LITHOLOGIC LOG
5		0-10.5	10.5/0.0	Gravel (1/4" to 1-1/2") and crushed tuff	
10	1	10.5-13.0	2.5/1.8	Augered into top of glass at 10.5 ft and began coring at 11.0 ft. Gray, partially melted /fused gravel (1"-2") from 11 to 11.8 ft; vesicles and horizontal fracture zone (0.1 ft); gray, partial to complete melting from 11.9 to 12.8 ft; vertical and near vertical fracturing from 12.8 to 13.0 ft.	
	2	13.0-15.0	2.0/1.8	Gray glass, machine breaks at 13.95, 14.1, 14.4, 14.6, and 14.7 ft. Conchoidal fracture at 14.8 ft. Sample collected.	
15	3	15.0-18.0	3.0/2.75	Gray glass, lighter colored gray banding, marbling, mix of large core pieces (up to 6") and highly fractured zones (fractures ~1/8"-1" apart) from 16 to 17 ft. Solid piece of core from 17.5 to 17.75 ft.	
20	4	18.0-20.0	2.0/1.4	Gray glass, silver colored metallic balls (1/16"-1/8") throughout run (~6-12 metallic balls per 6" of core), machine breaks at 18, 18.5, 18.6, 18.7, 19.2, 19.25, 19.35, and 19.75 ft. Conchoidal fractures throughout run, at 18.65 ft vertical fracture at ~20 degrees from vertical. Sample collected.	
25	5	20.0-23.0	3.0/3.0	Gray glass, metallic balls (silver colored 1/16"-1/8" and rusty colored 1/4"-1/2") from 20 to 20.65 ft, gradational contact from glass to tuff between 20.85-21.25 ft, gray native tuff 21.25- 23.0 ft. Sample collected.	TD=23 ft

BOREHOLE ID: 21-02-19791	PROJECT: MDA-V Absorption Bed #1, TA-21	DATE: 6/7/02 - 6/14/02
TOTAL DEPTH: 21 ft bgs	BOREHOLE DIAMETER: 10 in. auger w/ 3 in. core	BOREHOLE ORIENTATION Vertical
DRILLING COMPANY: Kleinfelder	DRILLING METHOD: HSA rotary core w/ air	DRILLER: Rob Helton GEOLOGIST: Tom Benson

DEPTH (ft asl)	CORE RUN	FOOTAGE INTERVAL (ft)	DRILLED/ RECOVERED (ft)	DRILL CORE DESCRIPTIONS	LITHOLOGIC LOG
5		0-10.2	10.2/0.0	Gravel (1/4" to 1-1/2") and crushed tuff.	
10	1	10.2-11.8	1.6/1.0	Augered into glass at 10.2 ft and began coring. Gray, fused partially melted gravel (1/2"-1") from 10.2 to 10.3 ft; gray, green vitrified product, vesicular (1/8"-1/2"), marbling. Sample collected.	
	2	11.8-12.8	1.0/1.0	Gray glass with partially melted gravel, trace of silver colored metallic balls (1/16"-1/8"), marbling, vesicular (1/8"-1/4"). Sample collected.	
3→		12.8-13.0	0.2/0.2	Same	
15		13.0-19.0	6.0/0.0	Tri-coned; pulled bag sample at 15.0-17.0 ft	
20	4	19.0/21.0	2.0/2.0	Gray glass to 19.4 ft, then gradation to tuff.	
25					TD=21 ft



BOREHOLE ID: 21-02-19792	PROJECT: MDA-V Absorption Bed #1, TA-21	DATE: 6/6/02 - 6/18/02
TOTAL DEPTH: 18.3 ft bgs	BOREHOLE DIAMETER: 10 in. auger w/ 3 in. core	BOREHOLE ORIENTATION Vertical
DRILLING COMPANY: Kleinfelder	DRILLING METHOD: HSA rotary core w/ air	DRILLER: Rob Helton GEOLOGIST: Tom Benson

DEPTH (ft asl)	CORE RUN	FOOTAGE INTERVAL (ft)	DRILLED/ RECOVERED (ft)	DRILL CORE DESCRIPTIONS	LITHOLOGIC LOG
5		0-9.0	9.0/0.0	Gravel (1/4" to 1-1/2") and crushed tuff. Hard material encountered at 7 ft.	
10	1	9.0-9.5	0.5/0.0	Augered into top of glass at 9.0 ft and began coring at 9.5 ft.	
		9.5-10.5	1.0/0.2	Gray glass, chunk stuck in core barrel end piece preventing core entering barrel.	
15		10.5-16.0	5.5/0.0	Triconed, sample collected at 14.0-16.0 ft.	
				Gray glass, granular texture, metallic ball (3/8") at ~16.1 ft. Sample taken.	
	2	16.0-16.9	0.9/0.9		
	3	16.9-18.3	1.4/1.4	Same gray glass to 17.7 ft, tuff from 17.7 to 18.3 ft, grayish tone. Sample taken.	
20					TD= 18.3 ft
25					

Appendix C

Results of Quality Assurance/Quality Control Activities

C-1.0 SUMMARY OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

This appendix consists of an assessment of the quality of analytical results for Solid Waste Management Unit (SWMU) 21-018(a)-99 samples collected for the nontraditional in situ vitrification (NTISV) hot demonstration in 2000 and 2002. Table C-1.0-1 presents the analytical suites analyzed for all the samples during this investigation. (In this appendix, "soil" refers to solid samples and may include sediment, soil and tuff samples.)

Table C-1.0-1
Analytical Suites

Chemical Category	Analyte List	Analytical Method
Radionuclides	Gamma emitting radionuclides	Gamma spectroscopy EPA Method 901.1
	Tritium	Liquid scintillation EPA Method 906.0
	Strontium-90	Proportional counting EPA Method 905.0
	Isotopic uranium	Chemical separation alpha spectroscopy HASL-300
	Isotopic plutonium	Chemical separation alpha spectroscopy HASL-300
Inorganic chemicals	Target analyte list metals	EPA Method 6010B EPA Method 6020 EPA Method 7470A EPA Method 7471A
Product consistency test (PCT)	Gamma emitting radionuclides Strontium-90 Isotopic Uranium Isotopic Plutonium	ASTM: C1285-94 *Analytical test methods are listed above.
Toxicity characteristic leaching procedure (TCLP)	TCLP target analyte list metals	SW-846: Chapter 7 *Analytical test methods are listed above.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the requirements of the *Quality Assurance Project Plan Requirements for Sampling and Analysis* (LANL 1996, 54609). The results of the QA/QC activities were used to estimate accuracy, bias, and precision of the analytical measurements. QC samples including method blanks, matrix spikes and laboratory control samples were used to assess accuracy and bias. Internal standards, surrogates and tracers were also used to assess accuracy. Other QC factors such as sample preservation and holding times were also assessed. The requirements for sample preservation and holding times are given in the RRES-RS project standard operating procedure (SOP) LANL-ER-SOP-1.02, Rev. 0, "Sample Containers and Preservation." Evaluating these QC indicators allows estimates to be made of the accuracy, bias, and precision of the analytical suites.

C-1.1 Samples Collected

A summary of the soil samples analyzed for the NTISV hot demonstration is presented in Table C-1.1-1.

Summaries of the analytical methods for metals and radionuclides analytes are provided in the following sections. The contract-required detection limit (CRDL) for each analyte listed is provided in Appendix D-1.0.

Table C-1.1-1
Summary of Samples Analyzed for the NTISV Hot Demonstration

Request Number	Collection Date	Sample ID	Analytical Suite	Analytical Laboratory
Inorganic Chemicals				
6461R	2/13/00	MD21-00-0001 MD21-00-0002 MD21-00-0003 MD21-00-0004 MD21-00-0005 MD21-00-0006 MD21-00-0007 MD21-00-0008 MD21-00-0009 MD21-00-0010 MD21-00-0011 MD21-00-0012 MD21-00-0013	Target Analyte List Metals EPA SW-846 Method 6010B Mercury EPA SW-846 Method 7471A	Paragon
6792R	5/1/00	MD21-00-0025 MD21-00-0026 MD21-00-0027 MD21-00-0028 MD21-00-0029 MD21-00-0030 MD21-00-0031	Target Analyte List Metals EPA SW-846 Method 6010B Mercury EPA SW-846 Method 7471A	Paragon
950S-1	5/31/02 6/5/02 6/5/02 6/10/02 6/14/02 6/18/02 6/18/02 6/5/02	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Target Analyte List Metals EPA Method SW-846: 6010B EPA Method SW-846: 6020 Mercury EPA Method SW-846: 7471A	General Engineering
950S	5/31/02 6/5/02 6/5/02 6/10/02 6/14/02 6/18/02 6/18/02 6/5/02	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Target Analyte List Metals EPA Method SW-846: 6020_TCLP Mercury EPA Method SW-846: 7470A_TCLP	General Engineering

Table C-1.1-1 (continued)

Request Number	Collection Date	Sample ID	Analytical Suite	Analytical Laboratory
950S-2	5/31/02 6/5/02 6/5/02 6/10/02 6/14/02 6/18/02 6/18/02 5/31/02 5/31/02 6/5/02 6/5/02 6/5/02 6/5/02 6/10/02 6/10/02 6/14/02 6/14/02 6/18/02 6/18/02 6/18/02 6/18/02	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Target Analyte List Metals EPA Method SW-846: 6010B_PCT EPA Method SW-846: 6020_PCT Mercury EPA Method SW-846: 7470A_PCT	General Engineering
Radionuclides				
6462R	2/13/00	MD21-00-0001 MD21-00-0002 MD21-00-0003 MD21-00-0004 MD21-00-0005 MD21-00-0006 MD21-00-0007 MD21-00-0008 MD21-00-0009 MD21-00-0010 MD21-00-0011 MD21-00-0012 MD21-00-0013	Tritium Liquid Scintillation Strontium-90 Proportional Counting Isotopic Plutonium/Isotopic Uranium Chemical Separation Alpha Spectroscopy	Paragon
6793R	5/1/00	MD21-00-0025 MD21-00-0026 MD21-00-0027 MD21-00-0028 MD21-00-0029 MD21-00-0030 MD21-00-0031	Tritium Liquid Scintillation Strontium-90 Proportional Counting Isotopic Plutonium/Isotopic Uranium Chemical Separation Alpha Spectroscopy	Paragon
951S	5/31/02 6/5/02 6/5/02 6/10/02 6/14/02 6/18/02 6/18/02 6/5/02	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Gamma Spectroscopy EPA Method: 901.1 Strontium-90 EPA Method: 905.0 Tritium EPA Method: 906.0 Isotopic Plutonium HASL-300: ISOPU Isotopic Uranium HASL-300: ISOU	General Engineering

Table C-1.1-1 (continued)

Request Number	Collection Date	Sample ID	Analytical Suite	Analytical Laboratory
951S-1	5/31/02	MD21-02-45850	Gamma Spectroscopy	General Engineering
	6/5/02	MD21-02-45851	EPA Method: 901.1_PCT	
	6/5/02	MD21-02-45852	Strontium-90	
	6/10/02	MD21-02-45853	EPA Method: 905.0_PCT	
	6/14/02	MD21-02-45854	Isotopic Plutonium	
	6/18/02	MD21-02-45856	HASL-300: ISO_PU_PCT	
	6/18/02	MD21-02-45857	Isotopic Uranium	
	5/31/02	MD21-02-45866	HASL-300: ISO_U_PCT	
	5/31/02	MD21-02-45867		
	6/5/02	MD21-02-45868		
	6/5/02	MD21-02-45869		
	6/5/02	MD21-02-45870		
	6/5/02	MD21-02-45871		
	6/10/02	MD21-02-45875		
	6/10/02	MD21-02-45876		
	6/14/02	MD21-02-45877		
	6/14/02	MD21-02-45878		
	6/18/02	MD21-02-45884		
	6/18/02	MD21-02-45885		
	6/18/02	MD21-02-45886		
	6/18/02	MD21-02-45887		

C-2.0 INORGANIC CHEMICAL METHODS

Forty-nine soil samples were analyzed for the target analyte list (TAL) metals and TCLP TAL metals. The inorganic chemical methods for this data set are detailed in Table C-2.0-1. The analytical laboratories that analyzed the samples are shown in Table C-1.1-1. The qualifiers for the inorganic analytes are provided in Section C-4.0. Holding times were met for all inorganic chemical digestions and analyses. The CRDLs for inorganic chemicals are provided in Appendix D.

Table C-2.0-1
Analytical Methods for Inorganic Chemical Analysis

Analytical Method	Analytical Description	Analytical Suite
EPA SW-846 Method 6010B	Inductively coupled plasma emission spectroscopy (ICPES)	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, silver, thallium, vanadium, and zinc. (TAL metals)
EPA SW-846 Method 6020	Inductively coupled plasma-mass spectroscopy (ICPMS)	Arsenic, antimony, barium, beryllium, cadmium, chromium, lead, lithium, nickel, selenium, silver and thallium. (TAL metals)
EPA SW-846 Method 7470A EPA SW-846 Method 7471A	Cold vapor atomic absorption (CVAA)	Mercury (TAL metals)
SW-846: Chapter 7	SW-846: Chapter 7 *Analytical test methods are listed above	Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver (TCLP TAL metals)

C-2.1 Inorganic Quality Assurance/Quality Control Samples

Laboratory control samples (LCS), method blanks, and matrix spike samples were analyzed to assess accuracy and precision for inorganic chemical analyses. Each of these QA/QC sample types is described briefly in the sections below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. The analytical results for the samples were qualified according to National Functional Guidelines if the individual LCS recovery indicated an unacceptable bias in the measurement of individual analytes. The LCS recoveries should fall into the control limits of 80% to 120%.

Preparation blanks are used as a measurement of bias and potential cross contamination. All target analytes should be below the minimum detection limit in the preparation blank.

Accuracy for inorganic chemical analyses are also assessed using matrix spike samples. A matrix spike sample is designed to provide information about the effect of each sample matrix on the sample preparation procedures and analytical technique. The spike sample recoveries should be within the acceptance range.

C-3.0 RADIOCHEMICAL ANALYSES

Forty-two soil samples were analyzed for radionuclides by the methods listed in Table C-3.0-1. The reporting limits for radiochemicals are provided in Appendix D.

Table C-3.0-1
Analytical Methods for Radiochemical Analyses

Radiation and Radionuclide	Analytical Technique
Gamma-emitting radionuclides	Gamma spectroscopy EPA Method 901.1
Isotopic plutonium	Chemical separation/alpha spectroscopy HASL-300
Isotopic uranium	Chemical separation/alpha spectroscopy HASL-300
Tritium	Liquid scintillation EPA Method 906.0
Strontium-90	Proportional counting EPA Method 905.0
PCT (gamma-emitting radionuclides, isotopic uranium, isotopic plutonium, strontium-90)	ASTM: C1285-94 *Analytical test methods are listed above.

Radionuclides with reported values less than the minimum detectable activity (MDA) were qualified as not detected (U). The radionuclides qualified as not detected based on the MDA are summarized in Table C-4.0-3. Each radionuclide result was also compared with the corresponding 1-sigma total propagated uncertainty (TPU). If the result was not greater than three times the total propagated uncertainty, it was qualified as not detected (U). Radionuclides qualified as not detected (U) based on the 1-sigma TPU are also presented in Table C-4.0-3.

Discussion of Radiochemical Quality Assurance/Quality Control Samples

Precision and bias of radiochemical analyses performed at off-site fixed laboratories were assessed using matrix spike samples, laboratory control samples and method blanks.

LCS were analyzed to assess accuracy for radionuclide analyses. The LCS serves as a monitor of the overall performance of each step during the analysis, including the radiochemical separation preparation. The LCS recoveries should be within ±25% of the certified value. The analytical results for individual LCSs were all within the ±25% recovery control limit.

Method blanks are also used to assess bias. The method blank concentration should not exceed the MDA.

C-4.0 DATA VALIDATION

The following tables present the data qualifiers applied to each analyte for a given sample. The data qualifiers are defined in Table C-4.0-1. Table C-4.0-2 (inorganic data quality) and Table C-4.0-3 (radionuclide data quality) summarize the qualifiers for this data set.

Table C-4.0-1
Explanation of Data Qualifiers Used in the Data Validation Procedure

Qualifier	Explanation
U	The analyte was analyzed but considered not detected because of a specific Quality Issue.
J	The reported value should be regarded as estimated.
J+	The reported value should be regarded as estimated and biased high.
J-	The reported value should be regarded as estimated and biased low.
UJ	The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or detection limit.
R	The sample results were rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; presence or absence cannot be verified.

C-4.1 Inorganic Data Review

For Request 6461, Analytical Technologies, Inc. (ATI) analyzed thirteen soil samples for TAL metals.

- The holding times for these samples were met. The method blank results were below detection limits for all analytes, with the exception of cadmium, thallium and vanadium. The specific samples that are effected are regarded as not detected (U) because the results were less than 5X the result for these analytes in the preparation blank. The samples are shown in Table C-4.0-2. The recoveries for the laboratory control sample met acceptance criteria. All initial and continuing calibration verifications were within acceptance criteria. The matrix spike recoveries all met acceptance criteria, except for antimony and mercury. The results for mercury should be regarded as estimated and biased high (J+). The reporting limits for antimony should be regarded as estimated (UJ). The results for these analytes are therefore qualified as shown in Table C-4.0-2. The sample specific analytes qualified as estimated (J) because the results were less than the practical quantitation limit (PQL) but greater than the method detection limit (MDL) are also shown in Table C-4.0-2.

For Request 6792, Paragon analyzed seven soil samples for TAL metals.

- The holding times for these samples were met. The method blank results were below detection limits for all analytes, with the exception of beryllium, magnesium, potassium and sodium. The specific samples that are effected are regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank. The samples are shown in Table C-4.0-2. The recoveries for the laboratory control sample met acceptance criteria. All initial and continuing calibration verifications were within acceptance criteria. The matrix spikes recoveries all met acceptance criteria, except for antimony and aluminum. The results for aluminum should be regarded as estimated and biased high (J+). The reporting limits for antimony should be regarded as estimated (UJ). The results for these analytes are therefore qualified as shown in Table C-4.0-2. The sample specific analytes qualified as estimated (J) because the results were less than the PQL but greater than the MDL are also shown in Table C-4.0-2.

For Request 950S-1, General Engineering analyzed eight soil samples for TAL metals.

- The holding times for these samples were met. The method blank results were below detection limits for all analytes, with the exception of chromium, cobalt, mercury, vanadium, and zinc. The specific samples that are effected are regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank. The samples are shown in Table C-4.0-2. The recoveries for the laboratory control sample met acceptance criteria. All initial and continuing calibration verifications were within acceptance criteria. The matrix spike recoveries all met acceptance criteria, except for copper, iron and lead. The results for copper and iron should be regarded as estimated and biased high (J+). The results for lead should be regarded as estimated and biased low (J-). The results for these analytes are therefore qualified as shown in Table C-4.0-2. The reporting limit for copper should be regarded as estimated (UJ) because both the sample and duplicate sample result were greater than or equal to 5 times the reporting limit and the duplicate relative percent difference (RPD) was greater than the acceptance criteria. The result for aluminum should be regarded as estimated (J) because the serial dilution sample RPD was greater than 10 and the sample result was greater than 50 times the MDL. The sample specific analytes qualified as estimated (J) because the results were less than the PQL but greater than the MDL are also shown in Table C-4.0-2.

For Request 950S, ATI analyzed eight soil samples for TCLP.

- The holding times for these samples were met. The method blank results were below detection limits for all analytes, with the exception of lead and selenium. The specific samples that are effected are regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank. The samples are shown in Table C-4.0-2. The recoveries for the laboratory control sample met acceptance criteria. All initial and continuing calibration verifications were within acceptance criteria. The matrix spike recoveries all met acceptance criteria.

For Request 950S-2, General Engineering analyzed twenty-one soil samples for TAL metals.

- The holding times for these samples were met. The method blank results were below detection limits for all analytes, with the exception of calcium, chromium, iron, magnesium and nickel. The specific samples that are effected are regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank. The samples are shown in Table C-4.0-2. The recoveries for the laboratory control sample met acceptance criteria. All initial and continuing calibration verifications were within acceptance criteria. The result for aluminum and sodium should be regarded as estimated (J) because the serial dilution sample RPD was greater than 10 and the sample result was greater than 50 times the MDL. The matrix spike recoveries all met acceptance criteria, except for beryllium and lithium. The results for these analytes should be regarded as estimated and biased high (J+) and are shown in Table C-4.0-2. The sample specific analytes qualified as estimated (J) because the results were less than the PQL but greater than the MDL are also shown in Table C-4.0-2.

Table C-4.0-2
Inorganic Chemical Data Quality Evaluation

Request	Location ID	Sample ID	Analyte	Explanation
6461R	21-11111	MD21-00-0001	Cadmium Thallium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
6461R	21-11112	MD21-00-0004	Thallium	The result for this analyte should be regarded as not detected (U) because the result was less than 5X the result for this analyte in the preparation blank.
6461R	21-11113	MD21-00-0008	Cadmium	The result for this analyte should be regarded as not detected (U) because the result was less than 5X the result for this analyte in the preparation blank.
6461R	21-11115	MD21-00-0013	Vanadium	The result for this analyte should be regarded as not detected (U) because the result was less than 5X the result for this analyte in the preparation blank.
6461R	21-11111 21-11111 21-11111 21-11112 21-11112 21-11112	MD21-00-0001 MD21-00-0002 MD21-00-0003 MD21-00-0004 MD21-00-0005 MD21-00-0006	Mercury	The results for this analyte should be regarded as estimated and biased high (J+) because the associated matrix spike recoveries were high.
6461R	21-11113 21-11113 21-11113 21-11114	MD21-00-0007 MD21-00-0008 MD21-00-0009 MD21-00-0011	Antimony	The reporting limits for this analyte should be regarded as estimated (UJ) because the associated matrix spike recoveries were low.
6461R	21-11111	MD21-00-0001	Antimony Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the method detection limit MDL.
6461R	21-11111	MD21-00-0002	Sodium	The result for this analyte should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11111	MD21-00-0003	Antimony Beryllium Silver Thallium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11112	MD21-00-0004	Antimony Cadmium Selenium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
6461R	21-11112	MD21-00-0005	Antimony Beryllium Selenium Silver Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11112	MD21-00-0006	Antimony Cadmium Silver	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11113	MD21-00-0007	Beryllium Cobalt Copper Selenium Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11113	MD21-00-0008	Barium Beryllium Cobalt Copper Magnesium Nickel Potassium Sodium Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11113 21-11114	MD21-00-0009 MD21-00-0011	Arsenic Barium Beryllium Cobalt Copper Magnesium Nickel Potassium Sodium Vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the PQL but greater than the MDL.
6461R	21-11114	MD21-00-0010	Antimony Barium Beryllium Cobalt Copper Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11115	MD21-00-0012	Antimony Beryllium Cobalt Copper Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6461R	21-11115	MD21-00-0013	Antimony Arsenic Barium Beryllium Cobalt Copper Magnesium Nickel Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
6792R	21-11158	MD21-00-0025	Beryllium Potassium Sodium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
6792R	21-11158	MD21-00-0026	Potassium Sodium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
6792R	21-11158	MD21-00-0027	Beryllium Magnesium Potassium Sodium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the results for these analytes in the preparation blank.
6792R	21-11158	MD21-00-0029	Beryllium Magnesium Potassium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
6792R	21-11158 21-11158 21-11158 21-11159 21-11159 21-11160 21-11160	MD21-00-0025 MD21-00-0026 MD21-00-0027 MD21-00-0028 MD21-00-0029 MD21-00-0030 MD21-00-0031	Aluminum	The results for this analyte should be regarded as estimated and biased high (J+) because the associated matrix spike recoveries were high.
6792R	21-11158 21-11159 21-11159 21-11160 21-11160	MD21-00-0026 MD21-00-0028 MD21-00-0029 MD21-00-0030 MD21-00-0031	Antimony	The reporting limits for this analyte should be regarded as estimated (UJ) because the associated matrix spike recoveries were low.
6792R	21-11158	MD21-00-0025	Antimony Barium Cadmium Cobalt Copper Magnesium Nickel Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6792R	21-11158 21-11159	MD21-00-0026 MD21-00-0028	Beryllium Cadmium Cobalt	The results for these analytes should be regarded as estimated (J) because the results were less than the PQL but greater than the MDL.
6792R	21-11158	MD21-00-0027	Antimony Barium Cadmium Cobalt Copper Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6792R	21-11159	MD21-00-0029	Barium Cadmium Cobalt Copper Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
6792R	21-11160	MD21-00-0030	Cadmium Cobalt Mercury	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
6792R	21-11160	MD21-00-0031	Cadmium Cobalt	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-1	21-02-19790 21-02-19790	MD21-02-45850 MD21-02-45851	Cobalt Mercury Vanadium	The results for these analytes should be regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank.
950S-1	21-02-19790	MD21-02-45852	Cobalt Mercury Vanadium Zinc	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
950S-1	21-02-19791 21-02-19792	MD21-02-45853 MD21-02-45857	Chromium Cobalt Mercury Vanadium Zinc	The results for these analytes should be regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank.
950S-1	21-02-19791 21-02-19792	MD21-02-45854 MD21-02-45856	Mercury Vanadium	The results for these analytes should be regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank.
950S-1	21-02-19790	MD21-02-45859	Chromium Cobalt Mercury Vanadium	The result for these analytes should be regarded as not detected (U) because the result was less than 5X the result for these analytes in the preparation blank.
950S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Copper Iron	The results for these analytes should be regarded as estimated and biased high (J+) because the analytes were recovered above the upper acceptance level (UAL) but less than 150% in the associated spike sample.
950S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Lead	The results for this analyte should be regarded as estimated and biased low (J-) because the analyte was recovered below the lower acceptance level (LAL) but greater than 30% in the associated spike sample.
950S-1	21-02-19792	MD21-02-45857	Copper	The reporting limit for this analyte should be regarded as estimated (UJ) because both the sample and duplicate sample result were greater than or equal to 5X the reporting limit and the duplicate relative percent difference (RPD) was greater than the acceptance criteria.
950S-1	21-02-19790	MD21-02-45850	Aluminum	The result for this analyte should be regarded as estimated (J) because the serial dilution sample RPD was greater than 10 and the sample result was greater than 50 times the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
950S-1	21-02-19790	MD21-02-45850	Thallium Selenium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-1	21-02-19790	MD21-02-45851	Antimony Beryllium Lead Selenium	The result for these analytes should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19790	MD21-02-45852	Barium Magnesium Potassium Nickel	The result for these analytes should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19791	MD21-02-45853	Antimony Barium Manganese Sodium	The result for these analytes should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19791	MD21-02-45854	Antimony Barium Selenium	The result for these analytes should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19792	MD21-02-45856	Antimony	The result for this analyte should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19792	MD21-02-45857	Barium Potassium	The result for these analytes should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S-1	21-02-19790	MD21-02-45859	Barium	The result for this analyte should be regarded as estimated (J) because the result was less than PQL but greater than the MDL.
950S	21-02-19790 21-02-19791	MD21-02-45850 MD21-02-45854	Selenium	The results for this analyte should be regarded as not detected (U) because the results were less than 5X the results for this analyte in the preparation blank.
950S	21-02-19790 21-02-19790 21-02-19791 21-02-19792 21-02-19792	MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45856 MD21-02-45857	Lead Selenium	The results for these analytes should be regarded as not detected (U) because the results were less than 5X the results for these analytes in the preparation blank.
950S	21-02-19790	MD21-02-45859	Lead	The result for this analyte should be regarded as not detected (U) because the result was less than 5X the result for this analyte in the preparation blank.
950S-2	21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869	Chromium Iron Magnesium	The results for these analytes should be regarded as not detected (U) because the results were less than 5x the results for these analytes in the preparation blank.
950S-2	21-02-19790 21-02-19790 21-02-19790	MD21-02-45852 MD21-02-45870 MD21-02-45871	Calcium Chromium	The results for these analytes should be regarded as not detected (U) because the results were less than 5x the results for these analytes in the preparation blank.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
950S-2	21-02-19792 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792	MD21-02-45857 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885	Nickel	The results for this analyte should be regarded as not detected (U) because the results were less than 5x the results for these analytes in the preparation blank.
950S-2	21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871	Lithium	The results for this analyte should be regarded as estimated and biased high (J+) because the analyte was recovered above the UAL but less than 150% in the associated spike sample.
950S-2	21-02-19790 21-02-19790	MD21-02-45852 MD21-02-45886	Lithium Beryllium	The results for these analytes should be regarded as estimated and biased high (J+) because the analytes were recovered above the UAL but less than 150% in the associated spike sample.
950S-2	21-02-19792	MD21-02-45857	Aluminum Sodium	The result for these analytes should be regarded as estimated (J) because the serial dilution sample RPD was greater than 10 and the sample result was greater than 50 times the MDL.
950S-2	21-02-19790	MD21-02-45850	Antimony Cobalt Manganese Nickel Thallium Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19790 21-02-19790	MD21-02-45851 MD21-02-45868	Antimony Calcium Manganese Nickel Thallium Vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the PQL but greater than the MDL.
950S-2	21-02-19790	MD21-02-45852	Arsenic Cobalt Copper Lead Manganese Nickel Thallium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19791	MD21-02-45853	Arsenic Chromium Iron Lithium Magnesium Manganese Nickel Thallium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
950S-2	21-02-19791	MD21-02-45854	Barium Chromium Iron Lithium Magnesium Nickel Thallium Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19792	MD21-02-45856	Barium Copper Iron Lithium Magnesium Manganese Thallium Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19792	MD21-02-45857	Calcium Chromium Cobalt Copper Iron Lithium Manganese Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19790	MD21-02-45866	Antimony Arsenic Cobalt Manganese Nickel Thallium Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19790	MD21-02-45867	Antimony Manganese Nickel Thallium Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19790	MD21-02-45869	Antimony Calcium Manganese Nickel Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19790	MD21-02-45870	Cobalt Copper Iron Lead Manganese Nickel Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
950S-2	21-02-19790	MD21-02-45871	Cobalt Copper Iron Lead Manganese Nickel	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19791	MD21-02-45875	Antimony Chromium Iron Lithium Magnesium Nickel Thallium Vanadium	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19791	MD21-02-45876	Antimony Chromium Iron Lithium Magnesium Mercury Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19791	MD21-02-45877	Barium Chromium Lithium Magnesium Mercury Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19791	MD21-02-45878	Barium Chromium Copper Iron Lithium Magnesium Mercury Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19792	MD21-02-45884	Barium Chromium Iron Lithium Magnesium Mercury Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19792	MD21-02-45885	Barium Chromium Lithium Mercury Vanadium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

Table C-4.0-2 (continued)

Request	Location ID	Sample ID	Analyte	Explanation
950S-2	21-02-19792	MD21-02-45886	Antimony Calcium Chromium Cobalt Copper Lead Lithium Manganese Nickel Thallium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.
950S-2	21-02-19792	MD21-02-45887	Antimony Calcium Cobalt Copper Lead Lithium Manganese Thallium Zinc	The result for these analytes should be regarded as estimated (J) because the result was less than the PQL but greater than the MDL.

C-4.2 Radionuclide Data Review

Radionuclides qualified as not detected (U) because the results were less than the minimum detectable activity (MDA) and those qualified because the results were less than 3 times the 1-sigma total propagated uncertainty are summarized in Table C-4.0-3. These radionuclides are not repeated in the text below.

For Request 6462, Paragon/ATI analyzed thirteen soil samples for radionuclides. No target analytes were detected in method blank. All tracer recoveries met acceptance criteria. The holding times were met.

For Request 6793, Paragon/ATI analyzed seven soil samples for radionuclides. No target analytes were detected in method blank. All tracer recoveries met acceptance criteria. The holding times were met.

For Request 951S, General Engineering analyzed eight soil samples for radionuclides. No target analytes were detected in method blank. All tracer recoveries met acceptance criteria. The holding times were met.

For Request 951S-1, General Engineering analyzed twenty-one soil samples for radionuclides. No target analytes were detected in method blank. All tracer recoveries met acceptance criteria. The holding times were met.

Table C-4.0-3
Radionuclide Chemical Data Quality Evaluation

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
6462R	21-11111	MD21-00-0002	Liquid Scintillation	Tritium	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma total propagated uncertainty (TPU).
6462R	21-11113	MD21-00-0009	Isotopic Uranium	Uranium-235	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
6462R	21-11113 21-11115	MD21-00-0009 MD21-00-0012	Isotopic Plutonium	Plutonium-239	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
6462R	21-11111 21-11111 21-11111 21-11112 21-11112 21-11112 21-11113 21-11114 21-11115	MD21-00-0001 MD21-00-0002 MD21-00-0003 MD21-00-0004 MD21-00-0005 MD21-00-0006 MD21-00-0008 MD21-00-0010 MD21-00-0013	Gamma Spectroscopy	Cesium-134	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
6462R	21-11111	MD21-00-0001	Gamma Spectroscopy	Cesium-137	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
6462R	21-11112 21-11112 21-11113 21-11113 21-11113	MD21-00-0005 MD21-00-0006 MD21-00-0007 MD21-00-0008 MD21-00-0009	Gamma Spectroscopy	Cobalt-60	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
6462R	21-11111 21-11111 21-11112 21-11113 21-11113 21-11113	MD21-00-0001 MD21-00-0003 MD21-00-0006 MD21-00-0007 MD21-00-0008 MD21-00-0009	Gamma Spectroscopy	Europium-152	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
6462R	21-11112 21-11113	MD21-00-0005 MD21-00-0008	Gamma Spectroscopy	Ruthenium-106	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
6462R	21-11113	MD21-00-0008	Gamma Spectroscopy	Sodium-22	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
6462R	21-11111	MD21-00-0002	Gamma Spectroscopy	Cobalt-60	The result for this analyte should be regarded as not detected (U) because the result was less than the minimum detectable activity (MDA).
6462R	21-11112 21-11113	MD21-00-0004 MD21-00-0007	Gamma Spectroscopy	Americium-241	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.

Table C-4.0-3 (continued)

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
6462R	21-11111 21-11112 21-11112 21-11113 21-11113 21-11113 21-11114 21-11114 21-11115 21-11115	MD21-00-0001 MD21-00-0004 MD21-00-0005 MD21-00-0007 MD21-00-0008 MD21-00-0009 MD21-00-0010 MD21-00-0011 MD21-00-0012 MD21-00-0013	Proportional Counting	Strontium-90	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
6793R	21-11158	MD21-00-0025	Gamma Spectroscopy	Americium-241	The result for this analyte should be regarded as not detected (U) because the result was less than the MDA.
6793R	21-11160	MD21-00-0030	Gamma Spectroscopy	Americium-241	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
6793R	21-11158 21-11158 21-11158 21-11159 21-11159 21-11160 21-11160	MD21-00-0025 MD21-00-0026 MD21-00-0027 MD21-00-0028 MD21-00-0029 MD21-00-0030 MD21-00-0031	Proportional Counting	Strontium-90	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Gamma Spectroscopy	Cesium-134 Europium-152 Ruthenium-106 Sodium-22 Cesium-137 Cobalt-60	The results for these analytes should be regarded as not detected (U) because the results were less than the MDA.
951S	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45859	Strontium_90	Strontium-90	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S	21-02-19790 21-02-19792 21-02-19790	MD21-02-45852 MD21-02-45857 MD21-02-45859	Gamma Spectroscopy	Americium-241	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S	21-02-19790 21-02-19790	MD21-02-45852 MD21-02-45859	Isotopic Plutonium	Plutonium-239	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S	21-02-19792	MD21-02-45857	Isotopic Uranium	Uranium-235	The result for this analyte should be regarded as not detected (U) because the result was less than the MDA.

Table C-4.0-3 (continued)

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
951S	21-02-19790	MD21-02-45859	Tritium	Tritium	The result for this analyte should be regarded as not detected (U) because the result was less than the MDA.
951S-1	21-02-19790 21-02-19792	MD21-02-45852 MD21-02-45884	Isotopic Plutonium	Plutonium-238	The results for this analyte should be regarded as not detected (U) because the results were less than 3 times the 1-sigma TPU.
951S-1	21-02-19790	MD21-02-45870	Isotopic Plutonium	Plutonium-239	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
951S-1	21-02-19792	MD21-02-45884	Isotopic Uranium	Uranium-235	The result for this analyte should be regarded as not detected (U) because the result was less than 3 times the 1-sigma TPU.
951S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Gamma Spectroscopy	Americium-241 Cesium-134 Cobalt-60 Europium-152 Ruthenium-106 Sodium-22	The results for these analytes should be regarded as not detected (U) because the results were less than the MDA.
951S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Gamma Spectroscopy	Cesium-137	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.

Table C-4.0-3 (continued)

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
951S-1	21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45885 MD21-02-45886 MD21-02-45887	Isotopic Plutonium	Plutonium-238	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Isotopic Plutonium	Plutonium-239	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.

Table C-4.0-3 (continued)

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
951S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Strontium_90	Strontium-90	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S-1	21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Isotopic Uranium	Uranium-234	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.

Table C-4.0-3 (continued)

Request	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
951S-1	21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45851 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45867 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45871 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45884 MD21-02-45885 MD21-02-45886 MD21-02-45887	Isotopic Uranium	Uranium-235	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.
951S-1	21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19790 21-02-19790 21-02-19790 21-02-19790 21-02-19791 21-02-19791 21-02-19791 21-02-19791 21-02-19792 21-02-19792 21-02-19792	MD21-02-45850 MD21-02-45852 MD21-02-45853 MD21-02-45854 MD21-02-45856 MD21-02-45857 MD21-02-45866 MD21-02-45868 MD21-02-45869 MD21-02-45870 MD21-02-45875 MD21-02-45876 MD21-02-45877 MD21-02-45878 MD21-02-45885 MD21-02-45886 MD21-02-45887	Isotopic Uranium	Uranium-238	The results for this analyte should be regarded as not detected (U) because the results were less than the MDA.

Reference

LANL (Los Alamos National Laboratory), March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory report LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 54609)

Appendix D

Analytical Suites and Results

D-1.0 TARGET ANALYTES AND DETECTION LIMITS

Tables D-1.0-1 and D-1.0-2 include the maximum required reporting limits or quantitation limits in accordance with the Environmental Restoration Project (now Risk Reduction and Environmental Stewardship-Remediation Services) analytical services statement of work for contract laboratories and the quality assurance project plan requirements for sampling and analysis (LANL 1995, 49738; LANL 1996, 54609). In most cases, reporting limits for the analytes were significantly lower than the detection or quantitation limits reported in these tables.

D-2.0 HOT DEMONSTRATION DATA

Table D-2.0-1 provides a side-by-side comparison of pre- and postdemonstration sample results. Tables D-2.0-2 through D-2.0-6 present the complete nontraditional in situ vitrification (NTISV) data set, including inorganic and radionuclide data for absorption bed, tuff, and glass samples; inorganic toxicity characteristic leaching procedure (TCLP) results; and inorganic and radionuclide product consistency test (PCT) results. In all tables, the report qualifier "U" indicates analyses were conducted for the analyte but it was not detected. The report qualifier "J" indicates the reported value is estimated. The report qualifier "J+" indicates the reported value is estimated and biased high; "J-" indicates the reported value is estimated and biased low. The report qualifier "UJ" indicates analyses were conducted for the analyte but it was not detected and the reported value is an estimate of the sample-specific quantitation limit or detection limit.

D-3.0 METAL AND RADIONUCLIDE DATA FOR AIR EMISSIONS

Tables D-3.0-1 and D-3.0-2 present a summary of the metal and radionuclide data for air emissions from the NTISV hot demonstration.

REFERENCES

LANL (Los Alamos National Laboratory), July 1995. "Statement of Work–Analytical Support," Revision 2, RFP No. 9-XS1-Q4257, Los Alamos, New Mexico. (LANL 1995, 49738)

LANL (Los Alamos National Laboratory), March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory report LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 54609)

Table D-1.0-1
Target Analytes and Estimated Detection Limits for Inorganic Chemical Analyses

Analyte	EPA[a] Sample Preparation Method	Analytical Technique	EDL[b] (mg/kg)
Aluminum	3050A	ICPES[c]	10
Antimony	3050A	ICPES	0.2
Arsenic	7060/3050A	ICPES/GFAA[d]	0.2
Barium	3050A	ICPES	10
Beryllium	3050A	ICPES	0.1
Cadmium	3050A	ICPES	0.25
Calcium	3050A	ICPES	250
Chromium	3050A	ICPES	0.5
Cobalt	3050A	ICPES	0.5
Copper	3050A	ICPES	0.5
Iron	3050A	ICPES	300
Lead	7421/3050A	ICPES/ICPMS[e]	2.0
Lithium	3050A	ICPES	2.5
Magnesium	3050A	ICPES	250
Manganese	3050A	ICPES	20
Mercury	7471	CVAA[f]	0.05
Molybdenum	3050A	ICPES	2.5
Nickel	3050A	ICPES	0.2
Oxalate	300.0	IC[g]	n/a[h]
Perchlorate	314.0	IC	n/a
Potassium	3050A	ICPES	250
Selenium	7740/3050A	ICPES/GFAA	0.2
Silver	3050A	ICPES	0.2
Sodium	3050A	ICPES	250
Strontium	905.0	ICPES	0.5
Thallium	7841/3050A	ICPES/GFAA/ICPMS	0.1
Uranium	3050A	ICPMS	0.1
Vanadium	3050A	ICPES	0.5
Zinc	3050A	ICPES	5.0

[a] EPA = US Environmental Protection Agency.
[b] EDL = Estimated detection limit.
[c] ICPES = Inductively coupled plasma emission spectroscopy by EPA SW-846 Method 6010.
[d] GFAA = Graphite furnace atomic absorption spectroscopy.
[e] ICPMS = Inductively coupled plasma mass spectrometry by EPA SW-846 Method 6020.
[f] CVAA = Cold vapor atomic absorption spectroscopy.
[g] IC = Ion chromatography.
[h] n/a = Not applicable.

Table D-1.0-2
Target Analytes and Estimated Quantitation Limits for Radionuclide Analyses

Analyte	Soil/Solids EQL pCi/g (except as noted)
Americium-241	0.05
Cesium-134	na*
Cesium-137	0.10
Cobalt-60	0.50
Europium-152	na
Plutonium-238	0.05
Plutonium-239	0.05
Ruthenium-106	na
Sodium-22	na
Strontium-90	0.5
Thorium-228	0.1
Thorium-230	0.1
Thorium-232	0.1
Tritium	250 pCi/L
Uranium-234	0.1
Uranium-235	0.1
Uranium-238	0.1

Note: All analyses were done by EPA contract laboratory program Method OLM1.8 or the equivalent EPA Method 8081. These methods are based on solvent extraction, concentration, and gas chromatography/electron capture detection and quantitation.

*na = Not available.

Table D-2.0-1
Comparison of Sample Values for Pre- and Post-Melt Tuff

Pre-Melt Borehole Sample Results				Post-Melt Borehole Sample Results			
Sample ID	Analyte	Sample Value	Units	Sample ID	Analyte	Sample Value	Units
Borehole 21-11113				**Borehole 21-11158**			
MD21-00-0007	Aluminum	840	mg/kg	MD21-00-0025	Aluminum	290(J+)	mg/kg
	Antimony	0.30(UJ)	mg/kg		Antimony	0.76(J)	mg/kg
	Arsenic	1.10	mg/kg		Arsenic	1.400	mg/kg
	Barium	11	mg/kg		Barium	9.1(J)	mg/kg
	Beryllium	0.31(J)	mg/kg		Beryllium	0.22(U)	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.063(J)	mg/kg
	Calcium	470	mg/kg		Calcium	460	mg/kg
	Cesium-134	0.290	pCi/g		Cesium-134	0.014(U)	pCi/g
	Chromium, Total	5.300	mg/kg		Chromium, Total	1.200	mg/kg
	Cobalt	0.39(J)	mg/kg		Cobalt	0.430(J)	mg/kg
	Cobalt-60	0.180	pCi/g		Cobalt-60	0.01(U)	pCi/g
	Copper	0.9(J)	mg/kg		Copper	0.99(J)	mg/kg
	Iron	2400	mg/kg		Iron	2200	mg/kg
	Lead	2.700	mg/kg		Lead	2.100	mg/kg
	Magnesium	150	mg/kg		Magnesium	99(J)	mg/kg
	Manganese	150	mg/kg		Manganese	170	mg/kg
	Nickel	4.40	mg/kg		Nickel	2.0(J)	mg/kg
	Plutonium-239	0.720	pCi/g		Plutonium-239	0.412	pCi/g
	Potassium	130	mg/kg		Potassium	150(U)	mg/kg
	Selenium	0.45(J)	mg/kg		Selenium	0.36(U)	mg/kg
	Sodium	50(J)	mg/kg		Sodium	110(U)	mg/kg
	Tritium	0.266	pCi/g		Tritium	2.280	pCi/g
	Uranium-234	0.800	pCi/g		Uranium-234	0.780	pCi/g
	Uranium-235	0.064(U)	pCi/g		Uranium-235	0.077	pCi/g
	Uranium-238	0.780	pCi/g		Uranium-238	0.720	pCi/g
	Vanadium	1.500	mg/kg		Vanadium	0.92(J)	mg/kg
	Zinc	20	mg/kg		Zinc	24	mg/kg
MD21-00-0008	Aluminum	190	mg/kg	MD21-00-0026	Aluminum	890(J+)	mg/kg
	Arsenic	1.200	mg/kg		Arsenic	1.5	mg/kg
	Barium	7.2(J)	mg/kg		Barium	11	mg/kg
	Beryllium	0.17(J)	mg/kg		Beryllium	0.34(J)	mg/kg
	Cadmium	0.032(U)	mg/kg		Cadmium	0.05(J)	mg/kg
	Calcium	410	mg/kg		Calcium	500	mg/kg
	Chromium, Total	14	mg/kg		Chromium, Total	1.3	mg/kg
	Cobalt	0.36(J)	mg/kg		Cobalt	0.52(J)	mg/kg

Table D-2.0-1 (continued)

Pre-Melt Borehole Sample Results				Post-Melt Borehole Sample Results			
Sample ID	Analyte	Sample Value	Units	Sample ID	Analyte	Sample Value	Units
	Copper	0.88(J)	mg/kg		Copper	1.100	mg/kg
	Iron	2000	mg/kg		Iron	2200	mg/kg
	Lead	1.8	mg/kg		Lead	2.1	mg/kg
	Magnesium	91(J)	mg/kg		Magnesium	150	mg/kg
	Manganese	150	mg/kg		Manganese	140	mg/kg
	Nickel	8.4	mg/kg		Nickel	2.2	mg/kg
	Plutonium-239	1.200	pCi/g		Plutonium-239	0.650	pCi/g
	Potassium	93(J)	mg/kg		Potassium	180(U)	mg/kg
	Sodium	54(J)	mg/kg		Sodium	110(U)	mg/kg
	Tritium	0.207	pCi/g		Tritium	2.120	pCi/g
	Uranium-234	0.680	pCi/g		Uranium-234	0.780	pCi/g
	Uranium-235	0.055(U)	pCi/g		Uranium-235	0.078	pCi/g
	Uranium-238	0.550	pCi/g		Uranium-238	0.690	pCi/g
	Vanadium	1.0(J)	mg/kg		Vanadium	1.400	mg/kg
	Zinc	24	mg/kg		Zinc	25	mg/kg
MD21-00-0009	Aluminum	150	mg/kg	MD21-00-0027	Aluminum	100(J+)	mg/kg
	Antimony	0.3(UJ)	mg/kg		Antimony	0.59(J)	mg/kg
	Arsenic	0.69(J)	mg/kg		Arsenic	1.200	mg/kg
	Barium	2.7(J)	mg/kg		Barium	2.6(J)	mg/kg
	Beryllium	0.18(J)	mg/kg		Beryllium	0.2(U)	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.035(J)	mg/kg
	Calcium	700	mg/kg		Calcium	570	mg/kg
	Chromium, Total	1.6	mg/kg		Chromium, Total	5.4	mg/kg
	Cobalt	0.29(J)	mg/kg		Cobalt	0.39(J)	mg/kg
	Copper	0.36(J)	mg/kg		Copper	0.77(J)	mg/kg
	Iron	1800	mg/kg		Iron	1100	mg/kg
	Lead	1.5	mg/kg		Lead	1.2	mg/kg
	Magnesium	74(J)	mg/kg		Magnesium	48(U)	mg/kg
	Manganese	150	mg/kg		Manganese	120	mg/kg
	Nickel	1.1(J)	mg/kg		Nickel	2.8	mg/kg
	Potassium	100(J)	mg/kg		Potassium	110(U)	mg/kg
	Sodium	79(J)	mg/kg		Sodium	90(U)	mg/kg
	Tritium	1.790	pCi/g		Tritium	2.000	pCi/g
	Uranium-234	0.780	pCi/g		Uranium-234	0.940	pCi/g
	Uranium-235	0.043(U)	pCi/g		Uranium-235	0.099	pCi/g
	Uranium-238	0.700	pCi/g		Uranium-238	0.830	pCi/g
	Vanadium	1.0(J)	mg/kg		Vanadium	0.78(J)	mg/kg

Table D-2.0-1 (continued)

Pre-Melt Borehole Sample Results				Post-Melt Borehole Sample Results			
Sample ID	Analyte	Sample Value	Units	Sample ID	Analyte	Sample Value	Units
	Zinc	26	mg/kg		Zinc	27	mg/kg
Borehole 21-11114				**Borehole 21-11159**			
MD21-00-0010	Aluminum	530	mg/kg	MD21-00-0028	Aluminum	1600(J+)	mg/kg
	Antimony	0.3(J)	mg/kg		Antimony	0.37(UJ)	mg/kg
	Arsenic	1.3	mg/kg		Arsenic	1.6	mg/kg
	Barium	5.9(J)	mg/kg		Barium	21	mg/kg
	Beryllium	0.22(J)	mg/kg		Beryllium	0.46(J)	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.038(J)	mg/kg
	Calcium	590	mg/kg		Calcium	1200	mg/kg
	Chromium, Total	3.6	mg/kg		Chromium, Total	4.2	mg/kg
	Cobalt	0.32(J)	mg/kg		Cobalt	0.58(J)	mg/kg
	Copper	0.62(J)	mg/kg		Copper	1.3	mg/kg
	Iron	2700	mg/kg		Iron	3500	mg/kg
	Lead	1.6	mg/kg		Lead	2.9	mg/kg
	Magnesium	260	mg/kg		Magnesium	510	mg/kg
	Manganese	90	mg/kg		Manganese	130	mg/kg
	Nickel	2.9	mg/kg		Nickel	5.0	mg/kg
	Potassium	180	mg/kg		Potassium	310	mg/kg
	Sodium	54(J)	mg/kg		Sodium	140	mg/kg
	Tritium	0.598	pCi/g		Tritium	0.303	pCi/g
	Uranium-234	0.670	pCi/g		Uranium-234	0.780	pCi/g
	Uranium-235	0.074	pCi/g		Uranium-235	0.072	pCi/g
	Uranium-238	0.740	pCi/g		Uranium-238	0.780	pCi/g
	Vanadium	1.900	mg/kg		Vanadium	2.500	mg/kg
	Zinc	11	mg/kg		Zinc	17	mg/kg
MD21-00-0011	Aluminum	120	mg/kg	MD21-00-0029	Aluminum	180(J+)	mg/kg
	Arsenic	0.8(J)	mg/kg		Arsenic	1.400	mg/kg
	Barium	3.2(J)	mg/kg		Barium	4.1(J)	mg/kg
	Beryllium	0.15(J)	mg/kg		Beryllium	0.26(U)	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.03(J)	mg/kg
	Calcium	630	mg/kg		Calcium	680	mg/kg
	Chromium, Total	2.500	mg/kg		Chromium, Total	4.7	mg/kg
	Cobalt	0.27(J)	mg/kg		Cobalt	0.4(J)	mg/kg
	Copper	0.31(J)	mg/kg		Copper	0.71(J)	mg/kg
	Iron	1500	mg/kg		Iron	1700	mg/kg
	Lead	1.4	mg/kg		Lead	1.4	mg/kg
	Magnesium	63(J)	mg/kg		Magnesium	80(U)	mg/kg

Table D-2.0-1 (continued)

Pre-Melt Borehole Sample Results				Post-Melt Borehole Sample Results			
Sample ID	Analyte	Sample Value	Units	Sample ID	Analyte	Sample Value	Units
	Manganese	150	mg/kg		Manganese	140	mg/kg
	Nickel	1.6(J)	mg/kg		Nickel	2.5	mg/kg
	Potassium	86(J)	mg/kg		Potassium	140(U)	mg/kg
	Ruthenium-106	3.4	pCi/g		Ruthenium-106	0.04(U)	pCi/g
	Sodium	67(J)	mg/kg		Sodium	140	mg/kg
	Tritium	1.130	pCi/g		Tritium	0.438	pCi/g
	Uranium-234	0.790	pCi/g		Uranium-234	0.860	pCi/g
	Uranium-235	0.103	pCi/g		Uranium-235	0.048(U)	pCi/g
	Uranium-238	8.0	pCi/g		Uranium-238	0.770	pCi/g
	Vanadium	0.6(J)	mg/kg		Vanadium	0.66(J)	mg/kg
	Zinc	30	mg/kg		Zinc	21	mg/kg
Borehole 21-11115				**Borehole 21-11160**			
MD21-00-0012	Aluminum	220	mg/kg	MD21-00-0030	Aluminum	2200(J+)	mg/kg
	Antimony	0.32(J)	mg/kg		Antimony	0.38(UJ)	mg/kg
	Arsenic	1.4	mg/kg		Arsenic	1.5	mg/kg
	Barium	14	mg/kg		Barium	14	mg/kg
	Beryllium	0.27(J)	mg/kg		Beryllium	0.990	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.044(J)	mg/kg
	Calcium	2200	mg/kg		Calcium	1000	mg/kg
	Cesium-134	0.200	pCi/g		Cesium-134	0.057(U)	pCi/g
	Chromium, Total	3.4	mg/kg		Chromium, Total	6.2	mg/kg
	Cobalt	0.4(J)	mg/kg		Cobalt	0.66(J)	mg/kg
	Copper	0.73(J)	mg/kg		Copper	2.0(J)	mg/kg
	Europium-152	0.420	pCi/g		Europium-152	0.09(U)	pCi/g
	Iron	2700	mg/kg		Iron	3800	mg/kg
	Lead	1.7	mg/kg		Lead	2.2	mg/kg
	Magnesium	240	mg/kg		Magnesium	570	mg/kg
	Manganese	190	mg/kg		Manganese	170	mg/kg
	Mercury	0.002(U)	mg/kg		Mercury	0.003(J)	mg/kg
	Nickel	4.0	mg/kg		Nickel	12	mg/kg
	Potassium	110	mg/kg		Potassium	370	mg/kg
	Sodium	65(J)	mg/kg		Sodium	120	mg/kg
	Tritium	15	pCi/g		Tritium	4.150	pCi/g
	Uranium-234	0.960	pCi/g		Uranium-234	0.810	pCi/g
	Uranium-235	0.085	pCi/g		Uranium-235	0.063	pCi/g
	Uranium-238	0.850	pCi/g		Uranium-238	0.840	pCi/g
	Vanadium	1.2	mg/kg		Vanadium	2.3	mg/kg

Table D-2.0-1 (continued)

Pre-Melt Borehole Sample Results				Post-Melt Borehole Sample Results			
Sample ID	Analyte	Sample Value	Units	Sample ID	Analyte	Sample Value	Units
	Zinc	16	mg/kg		Zinc	17	mg/kg
MD21-00-0013	Aluminum	230	mg/kg	MD21-00-0031	Aluminum	2200(J+)	mg/kg
	Antimony	0.42(J)	mg/kg		Antimony	0.38(UJ)	mg/kg
	Arsenic	0.71(J)	mg/kg		Arsenic	1.8	mg/kg
	Barium	4.0(J)	mg/kg		Barium	12	mg/kg
	Beryllium	0.2(J)	mg/kg		Beryllium	0.710	mg/kg
	Cadmium	0.018(U)	mg/kg		Cadmium	0.052(J)	mg/kg
	Calcium	710	mg/kg		Calcium	820	mg/kg
	Chromium, Total	2.5	mg/kg		Chromium, Total	4.4	mg/kg
	Cobalt	0.31(J)	mg/kg		Cobalt	0.62(J)	mg/kg
	Copper	0.36(J)	mg/kg		Copper	1.5	mg/kg
	Europium-152	0.620	pCi/g		Europium-152	0.000(U)	pCi/g
	Iron	2100	mg/kg		Iron	3400	mg/kg
	Lead	1.8	mg/kg		Lead	2.6	mg/kg
	Magnesium	93(J)	mg/kg		Magnesium	250	mg/kg
	Manganese	160	mg/kg		Manganese	180	mg/kg
	Nickel	1.5(J)	mg/kg		Nickel	3.000	mg/kg
	Potassium	110	mg/kg		Potassium	290	mg/kg
	Sodium	78(J)	mg/kg		Sodium	120	mg/kg
	Tritium	1.08	pCi/g		Tritium	1.1	pCi/g
	Uranium-234	0.64	pCi/g		Uranium-234	0.89	pCi/g
	Uranium-235	0.068	pCi/g		Uranium-235	0.089	pCi/g
	Uranium-238	0.57	pCi/g		Uranium-238	0.86	pCi/g
	Vanadium	0.69(U)	mg/kg		Vanadium	1.9	mg/kg
	Zinc	21	mg/kg		Zinc	23	mg/kg

Table D-2.0-2
Inorganic Chemical Data for NTISV Samples

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11111	MD21-00-0001	3–3	Fill	Aluminum	5500	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Antimony	0.71	mg/kg	J-
21-11111	MD21-00-0001	3–3	Fill	Arsenic	2.9	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Barium	97	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Beryllium	0.68	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Cadmium	0.13	mg/kg	U
21-11111	MD21-00-0001	3–3	Fill	Calcium	1600	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Chromium	6.6	mg/kg	J
21-11111	MD21-00-0001	3–3	Fill	Cobalt	4.3	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Copper	13	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Iron	9800	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Lead	24	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Magnesium	1100	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Manganese	300	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Mercury	0.62	mg/kg	J+
21-11111	MD21-00-0001	3–3	Fill	Nickel	6	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Potassium	890	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Selenium	0.72	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Silver	1.2	mg/kg	J
21-11111	MD21-00-0001	3–3	Fill	Sodium	70	mg/kg	J
21-11111	MD21-00-0001	3–3	Fill	Thallium	0.39	mg/kg	U
21-11111	MD21-00-0001	3–3	Fill	Vanadium	15	mg/kg	None
21-11111	MD21-00-0001	3–3	Fill	Zinc	53	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Aluminum	5100	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Antimony	6.8	mg/kg	J-
21-11111	MD21-00-0002	5–5	Fill	Arsenic	3.2	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Barium	160	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Beryllium	0.84	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Cadmium	9.5	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Calcium	1800	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Chromium	22	mg/kg	J
21-11111	MD21-00-0002	5–5	Fill	Cobalt	5.8	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Copper	93	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Iron	10000	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Lead	82	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Magnesium	1100	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Manganese	230	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Mercury	8.1	mg/kg	J+

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11111	MD21-00-0002	5–5	Fill	Nickel	18	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Potassium	900	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Selenium	0.96	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Silver	21	mg/kg	J
21-11111	MD21-00-0002	5–5	Fill	Sodium	96	mg/kg	J
21-11111	MD21-00-0002	5–5	Fill	Thallium	0.34	mg/kg	U
21-11111	MD21-00-0002	5–5	Fill	Vanadium	18	mg/kg	None
21-11111	MD21-00-0002	5–5	Fill	Zinc	210	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Aluminum	2900	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Antimony	1.1	mg/kg	J-
21-11111	MD21-00-0003	7–7	Fill	Arsenic	1.9	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Barium	140	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Beryllium	0.45	mg/kg	J
21-11111	MD21-00-0003	7–7	Fill	Cadmium	0.62	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Calcium	1600	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Chromium	7.9	mg/kg	J
21-11111	MD21-00-0003	7–7	Fill	Cobalt	3.7	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Copper	16	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Iron	7200	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Lead	16	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Magnesium	1000	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Manganese	260	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Mercury	1.3	mg/kg	J+
21-11111	MD21-00-0003	7–7	Fill	Nickel	8.2	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Potassium	700	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Selenium	0.76	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Silver	0.4	mg/kg	J
21-11111	MD21-00-0003	7–7	Fill	Sodium	210	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Thallium	0.43	mg/kg	J
21-11111	MD21-00-0003	7–7	Fill	Vanadium	13	mg/kg	None
21-11111	MD21-00-0003	7–7	Fill	Zinc	95	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Aluminum	6600	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Antimony	0.92	mg/kg	J-
21-11112	MD21-00-0004	3–3	Fill	Arsenic	3.6	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Barium	140	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Beryllium	0.73	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Cadmium	0.27	mg/kg	J
21-11112	MD21-00-0004	3–3	Fill	Calcium	1600	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Chromium	11	mg/kg	J

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11112	MD21-00-0004	3–3	Fill	Cobalt	5.6	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Copper	37	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Iron	12000	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Lead	21	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Magnesium	1400	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Manganese	320	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Mercury	0.24	mg/kg	J+
21-11112	MD21-00-0004	3–3	Fill	Nickel	7.4	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Potassium	1400	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Selenium	0.53	mg/kg	J
21-11112	MD21-00-0004	3–3	Fill	Silver	7.1	mg/kg	J
21-11112	MD21-00-0004	3–3	Fill	Sodium	110	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Thallium	0.47	mg/kg	U
21-11112	MD21-00-0004	3–3	Fill	Vanadium	21	mg/kg	None
21-11112	MD21-00-0004	3–3	Fill	Zinc	85	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Aluminum	2900	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Antimony	0.66	mg/kg	J-
21-11112	MD21-00-0005	5–5	Fill	Arsenic	3	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Barium	88	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Beryllium	0.45	mg/kg	J
21-11112	MD21-00-0005	5–5	Fill	Cadmium	0.94	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Calcium	1700	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Chromium	19	mg/kg	J
21-11112	MD21-00-0005	5–5	Fill	Cobalt	3.3	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Copper	17	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Iron	6600	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Lead	29	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Magnesium	840	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Manganese	270	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Mercury	0.75	mg/kg	J+
21-11112	MD21-00-0005	5–5	Fill	Nickel	6	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Potassium	500	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Selenium	0.51	mg/kg	J
21-11112	MD21-00-0005	5–5	Fill	Silver	0.26	mg/kg	J
21-11112	MD21-00-0005	5–5	Fill	Sodium	89	mg/kg	J
21-11112	MD21-00-0005	5–5	Fill	Thallium	0.33	mg/kg	U
21-11112	MD21-00-0005	5–5	Fill	Vanadium	14	mg/kg	None
21-11112	MD21-00-0005	5–5	Fill	Zinc	69	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Aluminum	4300	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11112	MD21-00-0006	7–7	Fill	Antimony	0.79	mg/kg	J-
21-11112	MD21-00-0006	7–7	Fill	Arsenic	2.9	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Barium	150	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Beryllium	0.6	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Cadmium	0.2	mg/kg	J
21-11112	MD21-00-0006	7–7	Fill	Calcium	2600	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Chromium	7.9	mg/kg	J
21-11112	MD21-00-0006	7–7	Fill	Cobalt	2.7	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Copper	11	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Iron	7300	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Lead	16	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Magnesium	1100	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Manganese	260	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Mercury	0.75	mg/kg	J+
21-11112	MD21-00-0006	7–7	Fill	Nickel	5.8	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Potassium	760	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Selenium	0.41	mg/kg	U
21-11112	MD21-00-0006	7–7	Fill	Silver	0.79	mg/kg	J
21-11112	MD21-00-0006	7–7	Fill	Sodium	190	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Thallium	0.34	mg/kg	U
21-11112	MD21-00-0006	7–7	Fill	Vanadium	12	mg/kg	None
21-11112	MD21-00-0006	7–7	Fill	Zinc	44	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Aluminum	840	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Aluminum	190	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Antimony	0.3	mg/kg	UJ
21-11113	MD21-00-0008	11–12.5	Qbt 3	Antimony	0.29	mg/kg	UJ
21-11113	MD21-00-0007	11–12.5	Qbt 3	Arsenic	1.1	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Arsenic	1.2	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Barium	11	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Barium	7.2	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Beryllium	0.31	mg/kg	J
21-11113	MD21-00-0008	11–12.5	Qbt 3	Beryllium	0.17	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Cadmium	0.018	mg/kg	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Cadmium	0.032	mg/kg	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Calcium	470	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Calcium	410	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Chromium	5.3	mg/kg	J
21-11113	MD21-00-0008	11–12.5	Qbt 3	Chromium	14	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Cobalt	0.39	mg/kg	J

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11113	MD21-00-0008	11–12.5	Qbt 3	Cobalt	0.36	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Copper	0.9	mg/kg	J
21-11113	MD21-00-0008	11–12.5	Qbt 3	Copper	0.88	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Iron	2400	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Iron	2000	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Lead	2.7	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Lead	1.8	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Magnesium	150	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Magnesium	91	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Manganese	150	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Manganese	150	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Mercury	0.002	mg/kg	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Mercury	0.002	mg/kg	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Nickel	4.4	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Nickel	8.4	mg/kg	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Potassium	130	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Potassium	93	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Selenium	0.45	mg/kg	J
21-11113	MD21-00-0008	11–12.5	Qbt 3	Selenium	0.4	mg/kg	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Silver	0.069	mg/kg	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Silver	0.066	mg/kg	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Sodium	50	mg/kg	J
21-11113	MD21-00-0008	11–12.5	Qbt 3	Sodium	54	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Thallium	0.34	mg/kg	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Thallium	0.33	mg/kg	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Vanadium	1.5	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Vanadium	1	mg/kg	J
21-11113	MD21-00-0007	11–12.5	Qbt 3	Zinc	20	mg/kg	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Zinc	24	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Aluminum	150	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Antimony	0.3	mg/kg	UJ
21-11113	MD21-00-0009	28–29	Qbt 3	Arsenic	0.69	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Barium	2.7	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Beryllium	0.18	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Cadmium	0.018	mg/kg	U
21-11113	MD21-00-0009	28–29	Qbt 3	Calcium	700	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Chromium	1.6	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Cobalt	0.29	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Copper	0.36	mg/kg	J

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11113	MD21-00-0009	28–29	Qbt 3	Iron	1800	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Lead	1.5	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Magnesium	74	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Manganese	150	mg/kg	None
21-11113	MD21-00-0009	28–29	Qbt 3	Mercury	0.002	mg/kg	U
21-11113	MD21-00-0009	28–29	Qbt 3	Nickel	1.1	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Potassium	100	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Selenium	0.41	mg/kg	U
21-11113	MD21-00-0009	28–29	Qbt 3	Silver	0.068	mg/kg	U
21-11113	MD21-00-0009	28–29	Qbt 3	Sodium	79	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Thallium	0.33	mg/kg	U
21-11113	MD21-00-0009	28–29	Qbt 3	Vanadium	1	mg/kg	J
21-11113	MD21-00-0009	28–29	Qbt 3	Zinc	26	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Aluminum	530	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Antimony	0.3	mg/kg	J-
21-11114	MD21-00-0010	11–12	Qbt 3	Arsenic	1.3	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Barium	5.9	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Beryllium	0.22	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Cadmium	0.018	mg/kg	U
21-11114	MD21-00-0010	11–12	Qbt 3	Calcium	590	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Chromium	3.6	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Cobalt	0.32	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Copper	0.62	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Iron	2700	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Lead	1.6	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Magnesium	260	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Manganese	90	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Mercury	0.002	mg/kg	U
21-11114	MD21-00-0010	11–12	Qbt 3	Nickel	2.9	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Potassium	180	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Selenium	0.4	mg/kg	U
21-11114	MD21-00-0010	11–12	Qbt 3	Silver	0.067	mg/kg	U
21-11114	MD21-00-0010	11–12	Qbt 3	Sodium	54	mg/kg	J
21-11114	MD21-00-0010	11–12	Qbt 3	Thallium	0.33	mg/kg	U
21-11114	MD21-00-0010	11–12	Qbt 3	Vanadium	1.9	mg/kg	None
21-11114	MD21-00-0010	11–12	Qbt 3	Zinc	11	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Aluminum	120	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Antimony	0.3	mg/kg	UJ
21-11114	MD21-00-0011	28–29	Qbt 3	Arsenic	0.8	mg/kg	J

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11114	MD21-00-0011	28–29	Qbt 3	Barium	3.2	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Beryllium	0.15	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Cadmium	0.018	mg/kg	U
21-11114	MD21-00-0011	28–29	Qbt 3	Calcium	630	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Chromium	2.5	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Cobalt	0.27	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Copper	0.31	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Iron	1500	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Lead	1.4	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Magnesium	63	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Manganese	150	mg/kg	None
21-11114	MD21-00-0011	28–29	Qbt 3	Mercury	0.002	mg/kg	U
21-11114	MD21-00-0011	28–29	Qbt 3	Nickel	1.6	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Potassium	86	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Selenium	0.4	mg/kg	U
21-11114	MD21-00-0011	28–29	Qbt 3	Silver	0.068	mg/kg	U
21-11114	MD21-00-0011	28–29	Qbt 3	Sodium	67	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Thallium	0.33	mg/kg	U
21-11114	MD21-00-0011	28–29	Qbt 3	Vanadium	0.6	mg/kg	J
21-11114	MD21-00-0011	28–29	Qbt 3	Zinc	30	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Aluminum	220	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Antimony	0.32	mg/kg	J-
21-11115	MD21-00-0012	11–12	Qbt 3	Arsenic	1.4	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Barium	14	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Beryllium	0.27	mg/kg	J
21-11115	MD21-00-0012	11–12	Qbt 3	Cadmium	0.018	mg/kg	U
21-11115	MD21-00-0012	11–12	Qbt 3	Calcium	2200	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Chromium	3.4	mg/kg	J
21-11115	MD21-00-0012	11–12	Qbt 3	Cobalt	0.4	mg/kg	J
21-11115	MD21-00-0012	11–12	Qbt 3	Copper	0.73	mg/kg	J
21-11115	MD21-00-0012	11–12	Qbt 3	Iron	2700	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Lead	1.7	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Magnesium	240	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Manganese	190	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Mercury	0.002	mg/kg	U
21-11115	MD21-00-0012	11–12	Qbt 3	Nickel	4	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Potassium	110	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Selenium	0.4	mg/kg	U
21-11115	MD21-00-0012	11–12	Qbt 3	Silver	0.067	mg/kg	U

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11115	MD21-00-0012	11–12	Qbt 3	Sodium	65	mg/kg	J
21-11115	MD21-00-0012	11–12	Qbt 3	Thallium	0.33	mg/kg	U
21-11115	MD21-00-0012	11–12	Qbt 3	Vanadium	1.2	mg/kg	None
21-11115	MD21-00-0012	11–12	Qbt 3	Zinc	16	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Aluminum	230	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Antimony	0.42	mg/kg	J-
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Arsenic	0.71	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Barium	4	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Beryllium	0.2	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Cadmium	0.018	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Calcium	710	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Chromium	2.5	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Cobalt	0.31	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Copper	0.36	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Iron	2100	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Lead	1.8	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Magnesium	93	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Manganese	160	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Mercury	0.002	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Nickel	1.5	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Potassium	110	mg/kg	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Selenium	0.4	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Silver	0.067	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Sodium	78	mg/kg	J
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Thallium	0.33	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Vanadium	0.69	mg/kg	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Zinc	21	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Aluminum	290	mg/kg	J+
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Aluminum	890	mg/kg	J+
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Antimony	0.76	mg/kg	UJ
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Antimony	0.36	mg/kg	UJ
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Arsenic	1.4	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Arsenic	1.5	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Barium	9.1	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Barium	11	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Beryllium	0.22	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Beryllium	0.34	mg/kg	J
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Cadmium	0.063	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Cadmium	0.05	mg/kg	J

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Calcium	460	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Calcium	500	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Chromium	1.2	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Chromium	1.3	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Cobalt	0.43	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Cobalt	0.52	mg/kg	J
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Copper	0.99	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Copper	1.1	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Iron	2200	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Iron	2200	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Lead	2.1	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Lead	2.1	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Magnesium	99	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Magnesium	150	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Manganese	170	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Manganese	140	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Mercury	0.0018	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Mercury	0.0018	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Nickel	2	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Nickel	2.2	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Potassium	150	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Potassium	180	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Selenium	0.36	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Selenium	0.36	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Silver	0.089	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Silver	0.09	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Sodium	110	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Sodium	110	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Thallium	0.35	mg/kg	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Thallium	0.35	mg/kg	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Vanadium	0.92	mg/kg	J
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Vanadium	1.4	mg/kg	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Zinc	24	mg/kg	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Zinc	25	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Aluminum	100	mg/kg	J+
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Antimony	0.59	mg/kg	UJ
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Arsenic	1.2	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Barium	2.6	mg/kg	J
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Beryllium	0.2	mg/kg	U

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Cadmium	0.035	mg/kg	J
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Calcium	570	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Chromium	5.4	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Cobalt	0.39	mg/kg	J
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Copper	0.77	mg/kg	J
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Iron	1100	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Lead	1.2	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Magnesium	48	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Manganese	120	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Mercury	0.0018	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Nickel	2.8	mg/kg	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Potassium	110	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Selenium	0.37	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Silver	0.092	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Sodium	90	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Thallium	0.36	mg/kg	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Vanadium	0.78	mg/kg	J
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Zinc	27	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Aluminum	1600	mg/kg	J+
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Antimony	0.37	mg/kg	UJ
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Arsenic	1.6	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Barium	21	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Beryllium	0.46	mg/kg	J
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Cadmium	0.038	mg/kg	J
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Calcium	1200	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Chromium	4.2	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Cobalt	0.58	mg/kg	J
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Copper	1.3	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Iron	3500	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Lead	2.9	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Magnesium	510	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Manganese	130	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Mercury	0.0018	mg/kg	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Nickel	5	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Potassium	310	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Selenium	0.38	mg/kg	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Silver	0.093	mg/kg	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Sodium	140	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Thallium	0.36	mg/kg	U

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Vanadium	2.5	mg/kg	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Zinc	17	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Aluminum	180	mg/kg	J+
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Antimony	0.37	mg/kg	UJ
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Arsenic	1.4	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Barium	4.1	mg/kg	J
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Beryllium	0.26	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Cadmium	0.03	mg/kg	J
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Calcium	680	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Chromium	4.7	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Cobalt	0.4	mg/kg	J
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Copper	0.71	mg/kg	J
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Iron	1700	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Lead	1.4	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Magnesium	80	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Manganese	140	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Mercury	0.0018	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Nickel	2.5	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Potassium	140	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Selenium	0.37	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Silver	0.092	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Sodium	140	mg/kg	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Thallium	0.36	mg/kg	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Vanadium	0.66	mg/kg	J
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Zinc	21	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Aluminum	2200	mg/kg	J+
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Antimony	0.38	mg/kg	UJ
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Arsenic	1.5	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Barium	14	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Beryllium	0.99	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Cadmium	0.044	mg/kg	J
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Calcium	1000	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Chromium	6.2	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Cobalt	0.66	mg/kg	J
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Copper	2	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Iron	3800	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Lead	2.2	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Magnesium	570	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Manganese	170	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Mercury	0.0032	mg/kg	J
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Nickel	12	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Potassium	370	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Selenium	0.38	mg/kg	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Silver	0.094	mg/kg	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Sodium	120	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Thallium	0.36	mg/kg	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Vanadium	2.3	mg/kg	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Zinc	17	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Aluminum	2200	mg/kg	J+
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Antimony	0.38	mg/kg	UJ
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Arsenic	1.8	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Barium	12	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Beryllium	0.71	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Cadmium	0.052	mg/kg	J
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Calcium	820	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Chromium	4.4	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Cobalt	0.62	mg/kg	J
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Copper	1.5	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Iron	3400	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Lead	2.6	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Magnesium	250	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Manganese	180	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Mercury	0.0019	mg/kg	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Nickel	3	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Potassium	290	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Selenium	0.38	mg/kg	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Silver	0.095	mg/kg	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Sodium	120	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Thallium	0.37	mg/kg	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Vanadium	1.9	mg/kg	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Zinc	23	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Aluminum	60.8	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Antimony	0.381	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Arsenic	0.442	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Barium	1.14	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Beryllium	0.0381	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Cadmium	0.442	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Calcium	161	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45850	13–15	Fill	Chromium	1.53	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Cobalt	0.127	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Copper	3.76	mg/kg	J+
21-02-19790	MD21-02-45850	13–15	Fill	Iron	272	mg/kg	J+
21-02-19790	MD21-02-45850	13–15	Fill	Lead	1.87	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Magnesium	23	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Manganese	2.44	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Mercury	0.012	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Nickel	0.813	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Potassium	16.5	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Selenium	0.315	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Silver	2.8	mg/kg	J-
21-02-19790	MD21-02-45850	13–15	Fill	Sodium	24.4	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Thallium	0.0482	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Vanadium	0.216	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Zinc	4.21	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Aluminum	80.8	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Antimony	0.0921	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Arsenic	0.481	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Barium	0.877	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Beryllium	0.0123	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Cadmium	0.481	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Calcium	318	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Chromium	1.36	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Cobalt	0.184	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Copper	7.13	mg/kg	J+
21-02-19790	MD21-02-45851	18–20	Fill	Iron	257	mg/kg	J+
21-02-19790	MD21-02-45851	18–20	Fill	Lead	0.399	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Magnesium	34.1	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Manganese	2.38	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Mercury	0.0108	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Nickel	1.6	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Potassium	23.3	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Selenium	0.184	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Silver	1.23	mg/kg	J-
21-02-19790	MD21-02-45851	18–20	Fill	Sodium	21.3	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Thallium	0.096	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Vanadium	0.245	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Zinc	2.82	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45852	20–21	Fill	Aluminum	9.96	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Antimony	0.378	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Arsenic	0.491	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Barium	0.12	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Beryllium	0.0378	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Cadmium	0.491	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Calcium	12.7	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Chromium	1.04	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Cobalt	0.0928	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Copper	0.704	mg/kg	J+
21-02-19790	MD21-02-45852	20–21	Fill	Iron	103	mg/kg	J+
21-02-19790	MD21-02-45852	20–21	Fill	Lead	0.491	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Magnesium	1.92	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Manganese	1.04	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Mercury	0.0177	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Nickel	0.207	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Potassium	6.1	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Selenium	0.491	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Silver	0.777	mg/kg	J-
21-02-19790	MD21-02-45852	20–21	Fill	Sodium	17.5	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Thallium	0.0946	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Vanadium	0.185	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Zinc	0.751	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Aluminum	88.7	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Antimony	0.366	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Arsenic	3.21	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Barium	0.329	mg/kg	J
21-02-19790	MD21-02-45859	21–23	Qbt 3	Beryllium	0.109	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cadmium	0.49	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Calcium	529	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Chromium	0.22	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cobalt	0.159	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Copper	0.51	mg/kg	J+
21-02-19790	MD21-02-45859	21–23	Qbt 3	Iron	540	mg/kg	J+
21-02-19790	MD21-02-45859	21–23	Qbt 3	Lead	0.49	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Magnesium	34.7	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Manganese	86.9	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Mercury	0.0105	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Nickel	0.393	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45859	21–23	Qbt 3	Potassium	49.1	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Selenium	0.49	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Silver	1	mg/kg	J-
21-02-19790	MD21-02-45859	21–23	Qbt 3	Sodium	87.1	mg/kg	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Thallium	0.0916	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Vanadium	0.628	mg/kg	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Zinc	8.49	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Aluminum	10.2	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Antimony	0.35	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Arsenic	0.439	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Barium	0.127	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Beryllium	0.0388	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Cadmium	0.439	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Calcium	11.1	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Chromium	0.856	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Cobalt	0.151	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Copper	0.673	mg/kg	J+
21-02-19791	MD21-02-45853	11–13	Fill	Iron	146	mg/kg	J+
21-02-19791	MD21-02-45853	11–13	Fill	Lead	0.439	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Magnesium	2.92	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Manganese	0.674	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Mercury	0.016	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Nickel	3.6	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Potassium	8.78	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Selenium	0.439	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Silver	0.855	mg/kg	J-
21-02-19791	MD21-02-45853	11–13	Fill	Sodium	5.84	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Thallium	0.097	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Vanadium	0.167	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Zinc	0.911	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Aluminum	32.3	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Antimony	0.115	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Arsenic	0.476	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Barium	0.309	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Beryllium	0.0368	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Cadmium	0.476	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Calcium	273	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Chromium	2.57	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Cobalt	0.795	mg/kg	None

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45854	15–17	Fill	Copper	2.31	mg/kg	J+
21-02-19791	MD21-02-45854	15–17	Fill	Iron	1070	mg/kg	J+
21-02-19791	MD21-02-45854	15–17	Fill	Lead	0.476	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Magnesium	17.2	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Manganese	4.97	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Mercury	0.0106	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Nickel	3.28	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Potassium	21	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Selenium	0.313	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Silver	0.0199	mg/kg	J-
21-02-19791	MD21-02-45854	15–17	Fill	Sodium	59.8	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Thallium	0.0919	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Vanadium	0.254	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Zinc	1.99	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Aluminum	44.6	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Antimony	0.0654	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Arsenic	0.724	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Barium	0.49	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Beryllium	0.0388	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Cadmium	0.481	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Calcium	519	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Chromium	1.38	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Cobalt	0.767	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Copper	1.7	mg/kg	J+
21-02-19792	MD21-02-45856	14–16	Fill	Iron	1370	mg/kg	J+
21-02-19792	MD21-02-45856	14–16	Fill	Lead	0.481	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Magnesium	31.1	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Manganese	5.11	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Mercury	0.0146	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Nickel	1.24	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Potassium	25.5	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Selenium	0.481	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Silver	0.107	mg/kg	J-
21-02-19792	MD21-02-45856	14–16	Fill	Sodium	71.1	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Thallium	0.0971	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Vanadium	0.698	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Zinc	1.09	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Aluminum	8.18	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Antimony	0.397	mg/kg	U

Table D-2.0-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45857	16–17.7	Fill	Arsenic	0.299	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Barium	0.0573	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Beryllium	0.0397	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cadmium	0.299	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Calcium	12.6	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Chromium	0.152	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cobalt	0.0642	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Copper	0.299	mg/kg	UJ
21-02-19792	MD21-02-45857	16–17.7	Fill	Iron	13.5	mg/kg	J+
21-02-19792	MD21-02-45857	16–17.7	Fill	Lead	0.299	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Magnesium	1.37	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Manganese	0.619	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Mercury	0.00771	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Nickel	1.27	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Potassium	4.16	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Selenium	0.299	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Silver	2.01	mg/kg	J-
21-02-19792	MD21-02-45857	16–17.7	Fill	Sodium	10.6	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Thallium	0.0992	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Vanadium	0.108	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Zinc	0.153	mg/kg	U

Table D-2.0-3
Radionuclide Data for NTISV Samples

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11111	MD21-00-0001	3–3	Fill	Americium-241	1.45	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Cesium-134	0.19	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Cesium-137	0.24	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Cobalt-60	0.26	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Europium-152	0.25	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Plutonium-238	0.51	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Plutonium-239	81	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Ruthenium-106	1.6	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Sodium-22	0.02	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Strontium-90	1.05	pCi/g	U
21-11111	MD21-00-0001	3–3	Fill	Tritium	7.14	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Uranium-234	39.8	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Uranium-235	2.13	pCi/g	None
21-11111	MD21-00-0001	3–3	Fill	Uranium-238	23.2	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Americium-241	12.9	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Cesium-134	0.14	pCi/g	U
21-11111	MD21-00-0002	5–5	Fill	Cesium-137	0.99	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Cobalt-60	0.39	pCi/g	U
21-11111	MD21-00-0002	5–5	Fill	Europium-152	1.25	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Plutonium-238	17.2	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Plutonium-239	2640	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Ruthenium-106	1.5	pCi/g	U
21-11111	MD21-00-0002	5–5	Fill	Sodium-22	0	pCi/g	U
21-11111	MD21-00-0002	5–5	Fill	Strontium-90	10.8	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Tritium	18.4	pCi/g	U
21-11111	MD21-00-0002	5–5	Fill	Uranium-234	277	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Uranium-235	16.2	pCi/g	None
21-11111	MD21-00-0002	5–5	Fill	Uranium-238	149	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Americium-241	9.1	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Cesium-134	0.12	pCi/g	U
21-11111	MD21-00-0003	7–7	Fill	Cesium-137	0.35	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Cobalt-60	0.21	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Europium-152	0.29	pCi/g	U
21-11111	MD21-00-0003	7–7	Fill	Plutonium-238	5.5	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Plutonium-239	1570	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Ruthenium-106	-0.2	pCi/g	U
21-11111	MD21-00-0003	7–7	Fill	Sodium-22	0.03	pCi/g	U
21-11111	MD21-00-0003	7–7	Fill	Strontium-90	12.1	pCi/g	None

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11111	MD21-00-0003	7–7	Fill	Tritium	27.6	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Uranium-234	144	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Uranium-235	7.7	pCi/g	None
21-11111	MD21-00-0003	7–7	Fill	Uranium-238	86	pCi/g	None
21-11112	MD21-00-0004	3–3	Fill	Americium-241	0	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Cesium-134	0.135	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Cesium-137	0.11	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Cobalt-60	0.083	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Europium-152	0.37	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Plutonium-238	0.014	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Plutonium-239	0.83	pCi/g	J
21-11112	MD21-00-0004	3–3	Fill	Ruthenium-106	1.5	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Sodium-22	-0.01	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Strontium-90	0.29	pCi/g	U
21-11112	MD21-00-0004	3–3	Fill	Tritium	9.2	pCi/g	None
21-11112	MD21-00-0004	3–3	Fill	Uranium-234	1.53	pCi/g	None
21-11112	MD21-00-0004	3–3	Fill	Uranium-235	0.122	pCi/g	None
21-11112	MD21-00-0004	3–3	Fill	Uranium-238	1.45	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Americium-241	5.6	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Cesium-134	0.14	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Cesium-137	0.11	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Cobalt-60	0.27	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Europium-152	0.54	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Plutonium-238	0.53	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Plutonium-239	50.5	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Ruthenium-106	1.8	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Sodium-22	-0.04	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Strontium-90	1.51	pCi/g	U
21-11112	MD21-00-0005	5–5	Fill	Tritium	19.3	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Uranium-234	9.8	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Uranium-235	0.97	pCi/g	None
21-11112	MD21-00-0005	5–5	Fill	Uranium-238	4.1	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Americium-241	1.66	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Cesium-134	0.25	pCi/g	U
21-11112	MD21-00-0006	7–7	Fill	Cesium-137	0	pCi/g	U
21-11112	MD21-00-0006	7–7	Fill	Cobalt-60	0.185	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Europium-152	0.36	pCi/g	U
21-11112	MD21-00-0006	7–7	Fill	Plutonium-238	0.77	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Plutonium-239	217	pCi/g	None

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11112	MD21-00-0006	7–7	Fill	Ruthenium-106	-0.19	pCi/g	U
21-11112	MD21-00-0006	7–7	Fill	Sodium-22	-0.01	pCi/g	U
21-11112	MD21-00-0006	7–7	Fill	Strontium-90	2.37	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Tritium	17.6	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Uranium-234	18	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Uranium-235	1	pCi/g	None
21-11112	MD21-00-0006	7–7	Fill	Uranium-238	7.4	pCi/g	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Americium-241	0	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Americium-241	0.26	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Cesium-134	0.29	pCi/g	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Cesium-134	0.1	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Cesium-137	0.03	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Cesium-137	0	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Cobalt-60	0.18	pCi/g	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Cobalt-60	0.026	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Europium-152	0.6	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Europium-152	0.29	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Plutonium-238	0.011	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Plutonium-238	-0.003	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Plutonium-239	0.72	pCi/g	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Plutonium-239	1.2	pCi/g	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Ruthenium-106	1.2	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Ruthenium-106	2.3	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Sodium-22	0.07	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Sodium-22	0.4	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Strontium-90	0.01	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Strontium-90	-0.05	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Tritium	0.266	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Tritium	0.207	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Uranium-234	0.8	pCi/g	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Uranium-234	0.68	pCi/g	None
21-11113	MD21-00-0007	11–12.5	Qbt 3	Uranium-235	0.064	pCi/g	U
21-11113	MD21-00-0008	11–12.5	Qbt 3	Uranium-235	0.055	pCi/g	U
21-11113	MD21-00-0007	11–12.5	Qbt 3	Uranium-238	0.78	pCi/g	None
21-11113	MD21-00-0008	11–12.5	Qbt 3	Uranium-238	0.55	pCi/g	None
21-11113	MD21-00-0009	28–29	Qbt 3	Americium-241	0.13	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Cesium-134	0.074	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Cesium-137	-0.02	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Cobalt-60	0.102	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11113	MD21-00-0009	28–29	Qbt 3	Europium-152	0.21	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Plutonium-238	-0.003	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Plutonium-239	0.028	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Ruthenium-106	0.11	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Sodium-22	0.076	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Strontium-90	0.33	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Tritium	1.79	pCi/g	None
21-11113	MD21-00-0009	28–29	Qbt 3	Uranium-234	0.78	pCi/g	None
21-11113	MD21-00-0009	28–29	Qbt 3	Uranium-235	0.043	pCi/g	U
21-11113	MD21-00-0009	28–29	Qbt 3	Uranium-238	0.7	pCi/g	None
21-11114	MD21-00-0010	11–12	Qbt 3	Americium-241	0.07	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Cesium-134	0.13	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Cesium-137	0.02	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Cobalt-60	-0.002	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Europium-152	0.19	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Plutonium-238	-0.004	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Plutonium-239	0.021	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Ruthenium-106	2.1	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Sodium-22	-0.03	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Strontium-90	0.08	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Tritium	0.598	pCi/g	None
21-11114	MD21-00-0010	11–12	Qbt 3	Uranium-234	0.67	pCi/g	None
21-11114	MD21-00-0010	11–12	Qbt 3	Uranium-235	0.074	pCi/g	U
21-11114	MD21-00-0010	11–12	Qbt 3	Uranium-238	0.74	pCi/g	None
21-11114	MD21-00-0011	28–29	Qbt 3	Americium-241	0.13	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Cesium-134	0.11	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Cesium-137	0.03	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Cobalt-60	0.019	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Europium-152	0.0246	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Plutonium-238	0.01	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Plutonium-239	0.031	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Ruthenium-106	3.4	pCi/g	None
21-11114	MD21-00-0011	28–29	Qbt 3	Sodium-22	-0.03	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Strontium-90	-0.29	pCi/g	U
21-11114	MD21-00-0011	28–29	Qbt 3	Tritium	1.13	pCi/g	None
21-11114	MD21-00-0011	28–29	Qbt 3	Uranium-234	0.79	pCi/g	None
21-11114	MD21-00-0011	28–29	Qbt 3	Uranium-235	0.103	pCi/g	None
21-11114	MD21-00-0011	28–29	Qbt 3	Uranium-238	8	pCi/g	None
21-11115	MD21-00-0012	11–12	Qbt 3	Americium-241	0.13	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11115	MD21-00-0012	11–12	Qbt 3	Cesium-134	0.2	pCi/g	None
21-11115	MD21-00-0012	11–12	Qbt 3	Cesium-137	0.01	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Cobalt-60	0.007	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Europium-152	0.42	pCi/g	None
21-11115	MD21-00-0012	11–12	Qbt 3	Plutonium-238	0.001	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Plutonium-239	0.018	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Ruthenium-106	2.4	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Sodium-22	-0.04	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Strontium-90	0.07	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Tritium	15	pCi/g	None
21-11115	MD21-00-0012	11–12	Qbt 3	Uranium-234	0.96	pCi/g	None
21-11115	MD21-00-0012	11–12	Qbt 3	Uranium-235	0.085	pCi/g	U
21-11115	MD21-00-0012	11–12	Qbt 3	Uranium-238	0.85	pCi/g	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Americium-241	0.53	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Cesium-134	0.19	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Cesium-137	0.03	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Cobalt-60	0.033	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Europium-152	0.62	pCi/g	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Plutonium-238	0	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Plutonium-239	0.0056	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Ruthenium-106	1	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Sodium-22	-0.04	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Strontium-90	-0.07	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Tritium	1.08	pCi/g	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Uranium-234	0.64	pCi/g	None
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Uranium-235	0.068	pCi/g	U
21-11115	MD21-00-0013	28.5–29.5	Qbt 3	Uranium-238	0.57	pCi/g	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Americium-241	0	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Americium-241	0.08	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Cesium-134	0.014	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Cesium-134	0.011	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Cesium-137	0.009	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Cesium-137	-0.028	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Cobalt-60	0.01	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Cobalt-60	0.004	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Europium-152	0.08	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Europium-152	0.06	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Plutonium-238	0.004	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Plutonium-238	0.013	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Plutonium-239	0.412	pCi/g	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Plutonium-239	0.65	pCi/g	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Ruthenium-106	0.04	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Ruthenium-106	0.12	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Sodium-22	0.046	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Sodium-22	-0.003	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Strontium-90	0.04	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Strontium-90	0.31	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Tritium	2.28	pCi/g	J-
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Tritium	2.12	pCi/g	J-
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Uranium-234	0.78	pCi/g	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Uranium-234	0.78	pCi/g	None
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Uranium-235	0.077	pCi/g	U
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Uranium-235	0.078	pCi/g	U
21-11158	MD21-00-0025	11.01–12.51	Qbt 3	Uranium-238	0.72	pCi/g	None
21-11158	MD21-00-0026	11.01–12.51	Qbt 3	Uranium-238	0.69	pCi/g	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Americium-241	0.01	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Cesium-134	-0.033	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Cesium-137	-0.04	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Cobalt-60	-0.015	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Europium-152	0.04	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Plutonium-238	0.003	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Plutonium-239	0.025	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Ruthenium-106	0.36	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Sodium-22	-0.003	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Strontium-90	-0.08	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Tritium	2	pCi/g	J-
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Uranium-234	0.94	pCi/g	None
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Uranium-235	0.099	pCi/g	U
21-11158	MD21-00-0027	28.02–29.02	Qbt 3	Uranium-238	0.83	pCi/g	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Americium-241	-0.05	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Cesium-134	-0.013	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Cesium-137	-0.019	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Cobalt-60	-0.008	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Europium-152	-0.06	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Plutonium-238	-0.004	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Plutonium-239	-0.002	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Ruthenium-106	-0.18	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Sodium-22	0.023	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Strontium-90	-0.04	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Tritium	0.303	pCi/g	J-
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Uranium-234	0.78	pCi/g	None
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Uranium-235	0.072	pCi/g	U
21-11159	MD21-00-0028	11.01–12.01	Qbt 3	Uranium-238	0.78	pCi/g	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Americium-241	0	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Cesium-134	-0.005	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Cesium-137	0.004	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Cobalt-60	0.019	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Europium-152	0.02	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Plutonium-238	0.001	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Plutonium-239	-0.002	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Ruthenium-106	0.04	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Sodium-22	0.006	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Strontium-90	0.08	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Tritium	0.438	pCi/g	J-
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Uranium-234	0.86	pCi/g	None
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Uranium-235	0.048	pCi/g	U
21-11159	MD21-00-0029	28.02–29.02	Qbt 3	Uranium-238	0.77	pCi/g	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Americium-241	0.46	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Cesium-134	-0.019	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Cesium-137	0.03	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Cobalt-60	0.007	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Europium-152	0.09	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Plutonium-238	0.005	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Plutonium-239	-0.002	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Ruthenium-106	-0.04	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Sodium-22	0.009	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Strontium-90	-0.03	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Tritium	4.15	pCi/g	J-
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Uranium-234	0.81	pCi/g	None
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Uranium-235	0.063	pCi/g	U
21-11160	MD21-00-0030	11.01–12.01	Qbt 3	Uranium-238	0.84	pCi/g	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Americium-241	0.04	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Cesium-134	-0.04	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Cesium-137	-0.007	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Cobalt-60	-0.03	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Europium-152	0	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Plutonium-238	0.012	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Plutonium-239	0.016	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Ruthenium-106	-0.09	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Sodium-22	-0.01	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Strontium-90	0.36	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Tritium	1.1	pCi/g	J-
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Uranium-234	0.89	pCi/g	None
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Uranium-235	0.089	pCi/g	U
21-11160	MD21-00-0031	28.52–29.52	Qbt 3	Uranium-238	0.86	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Americium-241	3.17	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Cesium-134	-0.0106	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Cesium-137	0.0059	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Cobalt-60	0.0112	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Europium-152	-0.0442	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Plutonium-238	0.974	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Plutonium-239	130	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Ruthenium-106	-0.215	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Sodium-22	0.0305	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Strontium-90	-0.0041	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-234	10.4	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-235	0.529	pCi/g	None
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-238	6.49	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Americium-241	2.56	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Cesium-134	-0.135	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Cesium-137	0.0098	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Cobalt-60	0.0159	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Europium-152	0.0277	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Plutonium-238	0.897	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Plutonium-239	109	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Ruthenium-106	0.0034	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Sodium-22	-0.0042	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Strontium-90	-0.0544	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-234	10.1	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-235	0.664	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-238	6.28	pCi/g	None
21-02-19790	MD21-02-45852	20–21	Fill	Americium-241	0.0219	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cesium-134	0.0004	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cesium-137	0.0094	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cobalt-60	0.03	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Europium-152	-0.0424	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45852	20–21	Fill	Plutonium-238	0.0248	pCi/g	None
21-02-19790	MD21-02-45852	20–21	Fill	Plutonium-239	0.0156	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Ruthenium-106	0.0052	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Sodium-22	-0.0129	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Strontium-90	0.137	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-234	1.09	pCi/g	None
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-235	0.105	pCi/g	None
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-238	1.13	pCi/g	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Americium-241	0.0089	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cesium-134	-0.0071	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cesium-137	-0.0283	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cobalt-60	-0.022	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Europium-152	0.0458	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Plutonium-238	0.0364	pCi/g	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Plutonium-239	0.0125	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Ruthenium-106	-0.0226	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Sodium-22	-0.0293	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Strontium-90	0.0584	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Tritium	-0.66	pCi/g	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Uranium-234	1.29	pCi/g	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Uranium-235	0.0571	pCi/g	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Uranium-238	0.87	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Americium-241	2.73	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Cesium-134	0.023	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Cesium-137	9E-05	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Cobalt-60	0.002	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Europium-152	0.007	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Plutonium-238	0.766	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Plutonium-239	119	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Ruthenium-106	0.0932	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Sodium-22	0.0082	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Strontium-90	-0.0693	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-234	10.3	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-235	0.484	pCi/g	None
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-238	6.15	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Americium-241	2.84	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Cesium-134	0.0102	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Cesium-137	0.0439	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Cobalt-60	0.0131	pCi/g	U

Table D-2.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45854	15–17	Fill	Europium-152	0.0071	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Plutonium-238	0.825	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Plutonium-239	124	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Ruthenium-106	0.266	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Sodium-22	0.0193	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Strontium-90	0.0492	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-234	11	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-235	0.5	pCi/g	None
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-238	6.74	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Americium-241	2.65	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Cesium-134	-0.0076	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Cesium-137	-0.0009	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Cobalt-60	-0.0069	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Europium-152	0.0075	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Plutonium-238	0.785	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Plutonium-239	107	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Ruthenium-106	0.169	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Sodium-22	-0.0013	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Strontium-90	0.0381	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-234	9.07	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-235	0.74	pCi/g	None
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-238	5.99	pCi/g	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Americium-241	0.12	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cesium-134	0.0131	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cesium-137	0.0206	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cobalt-60	0.0212	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Europium-152	-0.0493	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Plutonium-238	0.0322	pCi/g	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Plutonium-239	0.0885	pCi/g	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Ruthenium-106	-0.146	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Sodium-22	-0.0045	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Strontium-90	0.0429	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-234	1.25	pCi/g	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-235	0.0397	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-238	1.31	pCi/g	None

Table D-2.0-4
Inorganic TCLP Data for NTISV Samples

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45850	13–15	Fill	Arsenic	0.03	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Barium	24.7	µg/L	None
21-02-19790	MD21-02-45850	13–15	Fill	Cadmium	0.01	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Chromium	0.03	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Lead	0.02	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Mercury	0.002	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Selenium	13.4	µg/L	U
21-02-19790	MD21-02-45850	13–15	Fill	Silver	0.01	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Arsenic	0.03	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Barium	28.6	µg/L	None
21-02-19790	MD21-02-45851	18–20	Fill	Cadmium	0.01	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Chromium	0.03	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Lead	1.06	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Mercury	0.002	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Selenium	10.6	µg/L	U
21-02-19790	MD21-02-45851	18–20	Fill	Silver	0.01	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Arsenic	0.03	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Barium	22.8	µg/L	None
21-02-19790	MD21-02-45852	20–21	Fill	Cadmium	0.01	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Chromium	0.03	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Lead	0.7	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Mercury	0.002	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Selenium	13.8	µg/L	U
21-02-19790	MD21-02-45852	20–21	Fill	Silver	0.01	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Arsenic	47.1	µg/L	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Barium	24.6	µg/L	None
21-02-19790	MD21-02-45859	21–23	Qbt 3	Cadmium	0.01	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Chromium	0.03	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Lead	2.24	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Mercury	0.002	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Selenium	0.05	µg/L	U
21-02-19790	MD21-02-45859	21–23	Qbt 3	Silver	0.01	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Arsenic	0.03	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Barium	26.6	µg/L	None
21-02-19791	MD21-02-45853	11–13	Fill	Cadmium	0.01	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Chromium	0.03	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Lead	0.77	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Mercury	0.002	µg/L	U

Table D-2.0-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45853	11–13	Fill	Selenium	13.9	µg/L	U
21-02-19791	MD21-02-45853	11–13	Fill	Silver	0.01	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Arsenic	0.03	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Barium	33.1	µg/L	None
21-02-19791	MD21-02-45854	15–17	Fill	Cadmium	0.01	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Chromium	55.1	µg/L	None
21-02-19791	MD21-02-45854	15–17	Fill	Lead	0.02	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Mercury	0.002	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Selenium	17.5	µg/L	U
21-02-19791	MD21-02-45854	15–17	Fill	Silver	0.01	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Arsenic	0.03	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Barium	44.5	µg/L	None
21-02-19792	MD21-02-45856	14–16	Fill	Cadmium	0.01	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Chromium	66.6	µg/L	None
21-02-19792	MD21-02-45856	14–16	Fill	Lead	2.22	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Mercury	0.002	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Selenium	18.7	µg/L	U
21-02-19792	MD21-02-45856	14–16	Fill	Silver	0.01	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Arsenic	0.03	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Barium	26.5	µg/L	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Cadmium	0.01	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Chromium	0.03	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Lead	0.98	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Mercury	0.002	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Selenium	13.5	µg/L	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Silver	0.01	µg/L	U

Table D-2.0-5
Inorganic PCT Data for NITSV Samples

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45850	13–15	Fill	Aluminum	1.93	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Antimony	0.0003	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Calcium	0.134	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Chromium	0.0018	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Cobalt	0.0007	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Iron	0.0226	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Lithium	0.0055	mg/kg	J+
21-02-19790	MD21-02-45850	13–15	Fill	Magnesium	0.0366	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Manganese	0.0015	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Nickel	0.0012	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Potassium	0.218	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Silicon Dioxide	14.2	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45850	13–15	Fill	Sodium	2.91	mg/kg	None
21-02-19790	MD21-02-45850	13–15	Fill	Thallium	0.0003	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Vanadium	0.0006	mg/kg	J
21-02-19790	MD21-02-45850	13–15	Fill	Zinc	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Aluminum	1.79	mg/kg	None
21-02-19790	MD21-02-45866	13–15	Fill	Antimony	0.0004	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Arsenic	0.0035	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Beryllium	7E-05	mg/kg	J+
21-02-19790	MD21-02-45866	13–15	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Calcium	0.128	mg/kg	None
21-02-19790	MD21-02-45866	13–15	Fill	Chromium	0.0016	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Cobalt	0.0013	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Iron	0.0341	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45866	13–15	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Lithium	0.0057	mg/kg	J+
21-02-19790	MD21-02-45866	13–15	Fill	Magnesium	0.0326	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Manganese	0.0026	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Nickel	0.0013	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Potassium	0.194	mg/kg	None
21-02-19790	MD21-02-45866	13–15	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Silicon Dioxide	12.7	mg/kg	None
21-02-19790	MD21-02-45866	13–15	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45866	13–15	Fill	Sodium	2.67	mg/kg	None
21-02-19790	MD21-02-45866	13–15	Fill	Thallium	3E-05	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Vanadium	0.0011	mg/kg	J
21-02-19790	MD21-02-45866	13–15	Fill	Zinc	0.0034	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Aluminum	1.73	mg/kg	None
21-02-19790	MD21-02-45867	13–15	Fill	Antimony	0.0004	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Calcium	0.122	mg/kg	None
21-02-19790	MD21-02-45867	13–15	Fill	Chromium	0.0018	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Cobalt	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Iron	0.0202	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Lithium	0.0055	mg/kg	J+
21-02-19790	MD21-02-45867	13–15	Fill	Magnesium	0.0317	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Manganese	0.0035	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Nickel	0.0013	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Potassium	0.195	mg/kg	None
21-02-19790	MD21-02-45867	13–15	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Silicon Dioxide	13	mg/kg	None
21-02-19790	MD21-02-45867	13–15	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45867	13–15	Fill	Sodium	2.69	mg/kg	None
21-02-19790	MD21-02-45867	13–15	Fill	Thallium	2E-05	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Vanadium	0.0006	mg/kg	J
21-02-19790	MD21-02-45867	13–15	Fill	Zinc	0.005	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45851	18–20	Fill	Aluminum	1.36	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Antimony	0.0004	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Calcium	0.0745	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Chromium	0.0019	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Cobalt	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Iron	0.0316	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Lithium	0.0052	mg/kg	J+
21-02-19790	MD21-02-45851	18–20	Fill	Magnesium	0.0195	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Manganese	0.0015	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Nickel	0.0003	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Potassium	0.237	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Silicon Dioxide	14.4	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45851	18–20	Fill	Sodium	2.97	mg/kg	None
21-02-19790	MD21-02-45851	18–20	Fill	Thallium	5E-05	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Vanadium	0.0008	mg/kg	J
21-02-19790	MD21-02-45851	18–20	Fill	Zinc	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Aluminum	1.55	mg/kg	None
21-02-19790	MD21-02-45868	18–20	Fill	Antimony	0.0003	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Calcium	0.0812	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Chromium	0.0017	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Cobalt	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Iron	0.0216	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Lithium	0.0054	mg/kg	J+

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45868	18–20	Fill	Magnesium	0.022	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Manganese	0.0015	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Nickel	0.0005	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Potassium	0.205	mg/kg	None
21-02-19790	MD21-02-45868	18–20	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Silicon Dioxide	13.7	mg/kg	None
21-02-19790	MD21-02-45868	18–20	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45868	18–20	Fill	Sodium	2.74	mg/kg	None
21-02-19790	MD21-02-45868	18–20	Fill	Thallium	3E-05	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Vanadium	0.0014	mg/kg	J
21-02-19790	MD21-02-45868	18–20	Fill	Zinc	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Aluminum	1.42	mg/kg	None
21-02-19790	MD21-02-45869	18–20	Fill	Antimony	0.0004	mg/kg	J
21-02-19790	MD21-02-45869	18–20	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Calcium	0.0824	mg/kg	J
21-02-19790	MD21-02-45869	18–20	Fill	Chromium	0.0018	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Cobalt	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Copper	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Iron	0.0318	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Lead	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Lithium	0.0052	mg/kg	J+
21-02-19790	MD21-02-45869	18–20	Fill	Magnesium	0.0186	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Manganese	0.0021	mg/kg	J
21-02-19790	MD21-02-45869	18–20	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Nickel	0.0007	mg/kg	J
21-02-19790	MD21-02-45869	18–20	Fill	Potassium	0.221	mg/kg	None
21-02-19790	MD21-02-45869	18–20	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Silicon Dioxide	14	mg/kg	None
21-02-19790	MD21-02-45869	18–20	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Sodium	2.85	mg/kg	None
21-02-19790	MD21-02-45869	18–20	Fill	Thallium	0.0005	mg/kg	U
21-02-19790	MD21-02-45869	18–20	Fill	Vanadium	0.0009	mg/kg	J
21-02-19790	MD21-02-45869	18–20	Fill	Zinc	0.005	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Aluminum	3.49	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Antimony	0.002	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45852	20–21	Fill	Arsenic	0.0039	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Beryllium	7E-05	mg/kg	J+
21-02-19790	MD21-02-45852	20–21	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Calcium	0.0362	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Chromium	0.0037	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Cobalt	0.0026	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Copper	0.0015	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Iron	0.113	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Lead	0.003	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Lithium	0.0102	mg/kg	J+
21-02-19790	MD21-02-45852	20–21	Fill	Magnesium	0.1	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Manganese	0.0033	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Nickel	0.0018	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Potassium	0.321	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Silicon Dioxide	15.4	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Sodium	4.43	mg/kg	None
21-02-19790	MD21-02-45852	20–21	Fill	Thallium	4E-05	mg/kg	J
21-02-19790	MD21-02-45852	20–21	Fill	Vanadium	0.005	mg/kg	U
21-02-19790	MD21-02-45852	20–21	Fill	Zinc	0.0023	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Aluminum	3.25	mg/kg	None
21-02-19790	MD21-02-45870	20–21	Fill	Antimony	0.002	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Calcium	0.0317	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Chromium	0.0031	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Cobalt	0.0018	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Copper	0.0017	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Iron	0.0753	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Lead	0.0033	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Lithium	0.0091	mg/kg	J+
21-02-19790	MD21-02-45870	20–21	Fill	Magnesium	0.1	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Manganese	0.0025	mg/kg	J

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45870	20–21	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Nickel	0.0014	mg/kg	J
21-02-19790	MD21-02-45870	20–21	Fill	Potassium	0.28	mg/kg	None
21-02-19790	MD21-02-45870	20–21	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Silicon Dioxide	13.9	mg/kg	None
21-02-19790	MD21-02-45870	20–21	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Sodium	4.09	mg/kg	None
21-02-19790	MD21-02-45870	20–21	Fill	Thallium	0.0005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Vanadium	0.005	mg/kg	U
21-02-19790	MD21-02-45870	20–21	Fill	Zinc	0.0024	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Aluminum	3.53	mg/kg	None
21-02-19790	MD21-02-45871	20–21	Fill	Antimony	0.002	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Arsenic	0.005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Barium	0.005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Beryllium	0.0002	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Boron	0.05	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Cadmium	0.005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Calcium	0.047	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Chromium	0.0031	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Cobalt	0.0027	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Copper	0.0018	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Iron	0.0819	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Lead	0.004	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Lithium	0.0098	mg/kg	J+
21-02-19790	MD21-02-45871	20–21	Fill	Magnesium	0.1	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Manganese	0.0027	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Mercury	0.0002	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Nickel	0.0017	mg/kg	J
21-02-19790	MD21-02-45871	20–21	Fill	Potassium	0.303	mg/kg	None
21-02-19790	MD21-02-45871	20–21	Fill	Selenium	0.005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Silicon Dioxide	15	mg/kg	None
21-02-19790	MD21-02-45871	20–21	Fill	Silver	0.001	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Sodium	4.4	mg/kg	None
21-02-19790	MD21-02-45871	20–21	Fill	Thallium	0.0005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Vanadium	0.005	mg/kg	U
21-02-19790	MD21-02-45871	20–21	Fill	Zinc	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Aluminum	1.97	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Antimony	0.002	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Arsenic	0.0024	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Barium	0.005	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45853	11–13	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Boron	0.05	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Calcium	0.101	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Chromium	0.0028	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Copper	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Iron	0.0227	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Lithium	0.0044	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Magnesium	0.0206	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Manganese	0.001	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Mercury	0.0002	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Nickel	0.0011	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Potassium	0.185	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Selenium	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Silicon Dioxide	10.6	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Sodium	2.66	mg/kg	None
21-02-19791	MD21-02-45853	11–13	Fill	Thallium	0.0004	mg/kg	J
21-02-19791	MD21-02-45853	11–13	Fill	Vanadium	0.005	mg/kg	U
21-02-19791	MD21-02-45853	11–13	Fill	Zinc	0.0026	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Aluminum	1.89	mg/kg	None
21-02-19791	MD21-02-45875	11–13	Fill	Antimony	0.0003	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Arsenic	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Barium	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Boron	0.05	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Calcium	0.102	mg/kg	None
21-02-19791	MD21-02-45875	11–13	Fill	Chromium	0.0017	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Copper	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Iron	0.0223	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Lithium	0.0049	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Magnesium	0.0202	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Manganese	0.01	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Mercury	0.0002	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Nickel	0.0006	mg/kg	J

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45875	11–13	Fill	Potassium	0.185	mg/kg	None
21-02-19791	MD21-02-45875	11–13	Fill	Selenium	0.005	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Silicon Dioxide	11.5	mg/kg	None
21-02-19791	MD21-02-45875	11–13	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45875	11–13	Fill	Sodium	2.65	mg/kg	None
21-02-19791	MD21-02-45875	11–13	Fill	Thallium	3E-05	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Vanadium	0.0008	mg/kg	J
21-02-19791	MD21-02-45875	11–13	Fill	Zinc	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Aluminum	1.83	mg/kg	None
21-02-19791	MD21-02-45876	11–13	Fill	Antimony	0.0003	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Arsenic	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Barium	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Boron	0.05	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Calcium	0.107	mg/kg	None
21-02-19791	MD21-02-45876	11–13	Fill	Chromium	0.0025	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Copper	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Iron	0.0232	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Lithium	0.0046	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Magnesium	0.0195	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Manganese	0.01	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Mercury	5E-05	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Nickel	0.0003	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Potassium	0.199	mg/kg	None
21-02-19791	MD21-02-45876	11–13	Fill	Selenium	0.005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Silicon Dioxide	12.4	mg/kg	None
21-02-19791	MD21-02-45876	11–13	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Sodium	2.76	mg/kg	None
21-02-19791	MD21-02-45876	11–13	Fill	Thallium	0.0005	mg/kg	U
21-02-19791	MD21-02-45876	11–13	Fill	Vanadium	0.0006	mg/kg	J
21-02-19791	MD21-02-45876	11–13	Fill	Zinc	0.003	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Aluminum	1.16	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Antimony	0.002	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Arsenic	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Barium	0.001	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Boron	0.05	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45854	15–17	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Calcium	3.94	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Chromium	0.0021	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Copper	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Iron	0.012	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Lithium	0.0037	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Magnesium	0.0133	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Manganese	0.01	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Mercury	0.0002	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Nickel	0.0003	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Potassium	0.112	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Selenium	0.005	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Silicon Dioxide	10.1	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45854	15–17	Fill	Sodium	2.11	mg/kg	None
21-02-19791	MD21-02-45854	15–17	Fill	Thallium	7E-05	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Vanadium	0.0013	mg/kg	J
21-02-19791	MD21-02-45854	15–17	Fill	Zinc	0.0022	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Aluminum	1.12	mg/kg	None
21-02-19791	MD21-02-45877	15–17	Fill	Antimony	0.002	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Arsenic	0.005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Barium	0.001	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Boron	0.05	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Calcium	3.88	mg/kg	None
21-02-19791	MD21-02-45877	15–17	Fill	Chromium	0.0015	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Copper	0.005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Iron	0.1	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Lithium	0.0041	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Magnesium	0.0069	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Manganese	0.01	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Mercury	6E-05	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Nickel	0.0002	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Potassium	0.13	mg/kg	None
21-02-19791	MD21-02-45877	15–17	Fill	Selenium	0.005	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45877	15–17	Fill	Silicon Dioxide	10.5	mg/kg	None
21-02-19791	MD21-02-45877	15–17	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Sodium	2.38	mg/kg	None
21-02-19791	MD21-02-45877	15–17	Fill	Thallium	0.0005	mg/kg	U
21-02-19791	MD21-02-45877	15–17	Fill	Vanadium	0.0008	mg/kg	J
21-02-19791	MD21-02-45877	15–17	Fill	Zinc	0.0026	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Aluminum	1.13	mg/kg	None
21-02-19791	MD21-02-45878	15–17	Fill	Antimony	0.002	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Arsenic	0.005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Barium	0.001	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Beryllium	0.0002	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Boron	0.05	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Cadmium	0.005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Calcium	3.99	mg/kg	None
21-02-19791	MD21-02-45878	15–17	Fill	Chromium	0.0021	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Cobalt	0.005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Copper	0.0012	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Iron	0.0177	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Lead	0.005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Lithium	0.0043	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Magnesium	0.0091	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Manganese	0.01	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Mercury	9E-05	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Nickel	0.0002	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Potassium	0.137	mg/kg	None
21-02-19791	MD21-02-45878	15–17	Fill	Selenium	0.005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Silicon Dioxide	11	mg/kg	None
21-02-19791	MD21-02-45878	15–17	Fill	Silver	0.001	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Sodium	2.39	mg/kg	None
21-02-19791	MD21-02-45878	15–17	Fill	Thallium	0.0005	mg/kg	U
21-02-19791	MD21-02-45878	15–17	Fill	Vanadium	0.0008	mg/kg	J
21-02-19791	MD21-02-45878	15–17	Fill	Zinc	0.0041	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Aluminum	0.879	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Antimony	0.002	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Barium	0.0012	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Calcium	4.03	mg/kg	None

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45856	14–16	Fill	Chromium	0.0198	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Cobalt	0.005	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Copper	0.0019	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Iron	0.0679	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Lead	0.005	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Lithium	0.0045	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Magnesium	0.0092	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Manganese	0.0027	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Mercury	0.0002	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Nickel	0.0108	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Potassium	0.21	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Silicon Dioxide	11.1	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Silver	0.001	mg/kg	U
21-02-19792	MD21-02-45856	14–16	Fill	Sodium	2.83	mg/kg	None
21-02-19792	MD21-02-45856	14–16	Fill	Thallium	5E-05	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Vanadium	0.0015	mg/kg	J
21-02-19792	MD21-02-45856	14–16	Fill	Zinc	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Aluminum	0.919	mg/kg	None
21-02-19792	MD21-02-45884	14–16	Fill	Antimony	0.002	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Barium	0.0013	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Calcium	4.1	mg/kg	None
21-02-19792	MD21-02-45884	14–16	Fill	Chromium	0.0014	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Cobalt	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Copper	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Iron	0.018	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Lead	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Lithium	0.0046	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Magnesium	0.0067	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Manganese	0.01	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Mercury	7E-05	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Nickel	0.0004	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Potassium	0.232	mg/kg	None
21-02-19792	MD21-02-45884	14–16	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Silicon Dioxide	12.8	mg/kg	None
21-02-19792	MD21-02-45884	14–16	Fill	Silver	0.001	mg/kg	U

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45884	14–16	Fill	Sodium	3.11	mg/kg	None
21-02-19792	MD21-02-45884	14–16	Fill	Thallium	0.0005	mg/kg	U
21-02-19792	MD21-02-45884	14–16	Fill	Vanadium	0.0015	mg/kg	J
21-02-19792	MD21-02-45884	14–16	Fill	Zinc	0.003	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Aluminum	0.86	mg/kg	None
21-02-19792	MD21-02-45885	14–16	Fill	Antimony	0.002	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Barium	0.0013	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Calcium	4.85	mg/kg	None
21-02-19792	MD21-02-45885	14–16	Fill	Chromium	0.0015	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Cobalt	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Copper	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Iron	0.1	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Lead	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Lithium	0.0043	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Magnesium	0.1	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Manganese	0.01	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Mercury	8E-05	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Nickel	0.0003	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Potassium	0.183	mg/kg	None
21-02-19792	MD21-02-45885	14–16	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Silicon Dioxide	11.7	mg/kg	None
21-02-19792	MD21-02-45885	14–16	Fill	Silver	0.001	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Sodium	2.76	mg/kg	None
21-02-19792	MD21-02-45885	14–16	Fill	Thallium	0.0005	mg/kg	U
21-02-19792	MD21-02-45885	14–16	Fill	Vanadium	0.0018	mg/kg	J
21-02-19792	MD21-02-45885	14–16	Fill	Zinc	0.003	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Aluminum	3.92	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Antimony	0.002	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Barium	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Calcium	0.0424	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Chromium	0.0018	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Cobalt	0.0029	mg/kg	J

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45857	16–17.7	Fill	Copper	0.0027	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Iron	0.0876	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Lead	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Lithium	0.0081	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Magnesium	0.1	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Manganese	0.0022	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Mercury	0.0002	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Nickel	0.0013	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Potassium	0.315	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Silicon Dioxide	14.6	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Silver	0.001	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Sodium	4.72	mg/kg	J
21-02-19792	MD21-02-45857	16–17.7	Fill	Thallium	0.0005	mg/kg	None
21-02-19792	MD21-02-45857	16–17.7	Fill	Vanadium	0.005	mg/kg	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Zinc	0.0029	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Aluminum	4.4	mg/kg	None
21-02-19792	MD21-02-45886	16–17.7	Fill	Antimony	0.0003	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Barium	0.005	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Calcium	0.037	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Chromium	0.0016	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Cobalt	0.0039	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Copper	0.0018	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Iron	0.112	mg/kg	None
21-02-19792	MD21-02-45886	16–17.7	Fill	Lead	0.004	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Lithium	0.0092	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Magnesium	0.1	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Manganese	0.0032	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Mercury	0.0002	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Nickel	0.0015	mg/kg	J
21-02-19792	MD21-02-45886	16–17.7	Fill	Potassium	0.353	mg/kg	None
21-02-19792	MD21-02-45886	16–17.7	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Silicon Dioxide	17.3	mg/kg	None
21-02-19792	MD21-02-45886	16–17.7	Fill	Silver	0.001	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Sodium	5.34	mg/kg	None
21-02-19792	MD21-02-45886	16–17.7	Fill	Thallium	0.0002	mg/kg	J

Table D-2.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45886	16–17.7	Fill	Vanadium	0.005	mg/kg	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Zinc	0.003	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Aluminum	3.9	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Antimony	0.0004	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Arsenic	0.005	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Barium	0.005	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Beryllium	0.0002	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Boron	0.05	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Cadmium	0.005	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Calcium	0.0313	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Chromium	0.0096	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Cobalt	0.0027	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Copper	0.0019	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Iron	0.127	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Lead	0.0029	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Lithium	0.008	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Magnesium	0.1	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Manganese	0.0034	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Mercury	0.0002	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Nickel	0.0081	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Potassium	0.297	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Selenium	0.005	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Silicon Dioxide	15.5	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Silver	0.001	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Sodium	4.81	mg/kg	None
21-02-19792	MD21-02-45887	16–17.7	Fill	Thallium	9E-05	mg/kg	J
21-02-19792	MD21-02-45887	16–17.7	Fill	Vanadium	0.005	mg/kg	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Zinc	0.0037	mg/kg	J

Table D-2.0-6
Radionuclide PCT Data for NTISV Samples

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45850	13–15	Fill	Americium-241	0.108	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Cesium-134	-0.0205	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Cesium-137	0.0012	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Cobalt-60	-0.0328	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Europium-152	-0.0905	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Plutonium-238	0.0026	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Plutonium-239	0.0039	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Ruthenium-106	0.0107	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Sodium-22	0.007	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Strontium-90	0.137	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-234	-0.0014	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-235	0.0028	pCi/g	U
21-02-19790	MD21-02-45850	13–15	Fill	Uranium-238	-7E-10	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Americium-241	-0.179	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Cesium-134	0.0173	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Cesium-137	0.0276	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Cobalt-60	0.0371	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Europium-152	0.0119	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Plutonium-238	6E-10	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Plutonium-239	0.0024	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Ruthenium-106	0.0094	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Sodium-22	-0.0079	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Strontium-90	0.138	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Uranium-234	0.0163	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Uranium-235	0.0047	pCi/g	U
21-02-19790	MD21-02-45866	13–15	Fill	Uranium-238	0.0164	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Americium-241	0.0977	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Cesium-134	0.0197	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Cesium-137	0.0007	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Cobalt-60	0.016	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Europium-152	-0.018	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Plutonium-238	0.0012	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Plutonium-239	2E-09	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Ruthenium-106	0.247	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Sodium-22	0.0156	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Strontium-90	0.0031	pCi/g	U
21-02-19790	MD21-02-45867	13–15	Fill	Uranium-234	0.0791	pCi/g	None
21-02-19790	MD21-02-45867	13–15	Fill	Uranium-235	0.0038	pCi/g	U

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45867	13–15	Fill	Uranium-238	0.051	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Americium-241	0.117	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Cesium-134	-0.0055	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Cesium-137	0.0344	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Cobalt-60	0.0434	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Europium-152	-0.117	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Plutonium-238	3E-10	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Plutonium-239	-0.0011	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Ruthenium-106	0.19	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Sodium-22	-0.0098	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Strontium-90	0.165	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-234	0.0383	pCi/g	None
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-235	0.0048	pCi/g	U
21-02-19790	MD21-02-45851	18–20	Fill	Uranium-238	0.0239	pCi/g	None
21-02-19790	MD21-02-45868	18–20	Fill	Americium-241	0.086	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Cesium-134	-0.0689	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Cesium-137	-0.0091	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Cobalt-60	-0.0309	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Europium-152	0.0893	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Plutonium-238	0.0011	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Plutonium-239	-0.0146	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Ruthenium-106	-0.437	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Sodium-22	0.0203	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Strontium-90	0.133	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Uranium-234	0.0146	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Uranium-235	0.0049	pCi/g	U
21-02-19790	MD21-02-45868	18–20	Fill	Uranium-238	0.0036	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Americium-241	-0.153	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Cesium-134	-0.0462	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Cesium-137	0.033	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Cobalt-60	0.017	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Europium-152	-0.0023	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Plutonium-238	0.0011	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Plutonium-239	0.0032	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Ruthenium-106	0.225	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Sodium-22	-0.0054	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Strontium-90	0.0456	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Uranium-234	0.0013	pCi/g	U
21-02-19790	MD21-02-45869	18–20	Fill	Uranium-235	0.0026	pCi/g	U

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19790	MD21-02-45869	18–20	Fill	Uranium-238	0.0039	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Americium-241	0.0777	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cesium-134	-0.0122	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cesium-137	0.0063	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Cobalt-60	-0.0106	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Europium-152	0.0033	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Plutonium-238	0.004	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Plutonium-239	0.0013	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Ruthenium-106	0.35	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Sodium-22	0.0025	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Strontium-90	0.042	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-234	0.0011	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-235	0.0012	pCi/g	U
21-02-19790	MD21-02-45852	20–21	Fill	Uranium-238	0.0012	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Americium-241	-0.0495	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Cesium-134	-0.0411	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Cesium-137	-0.0256	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Cobalt-60	-0.0154	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Europium-152	-0.0403	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Plutonium-238	0.0013	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Plutonium-239	0.0159	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Ruthenium-106	0.346	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Sodium-22	0.0002	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Strontium-90	-0.0257	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Uranium-234	0.0072	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Uranium-235	0.0115	pCi/g	U
21-02-19790	MD21-02-45870	20–21	Fill	Uranium-238	0.0086	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Americium-241	0.33	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Cesium-134	-0.0094	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Cobalt-60	0.0556	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Europium-152	-0.121	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Plutonium-238	0.0044	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Plutonium-239	0.0011	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Ruthenium-106	-0.28	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Sodium-22	-0.0215	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Strontium-90	-0.0986	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Uranium-234	0.0209	pCi/g	None
21-02-19790	MD21-02-45871	20–21	Fill	Uranium-235	-0.0028	pCi/g	U
21-02-19790	MD21-02-45871	20–21	Fill	Uranium-238	0.0376	pCi/g	None

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45853	11–13	Fill	Americium-241	0.226	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Cesium-134	-0.0205	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Cesium-137	0.0018	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Cobalt-60	0.0524	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Europium-152	-0.0252	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Plutonium-238	-0.0014	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Plutonium-239	0.0029	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Ruthenium-106	0.192	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Sodium-22	-0.0205	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Strontium-90	0.0481	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-234	0.0052	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-235	0.0013	pCi/g	U
21-02-19791	MD21-02-45853	11–13	Fill	Uranium-238	0.0013	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Americium-241	0.0288	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Cesium-134	0.0342	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Cesium-137	0.0001	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Cobalt-60	0.0329	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Europium-152	0.0069	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Plutonium-238	-3E-10	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Plutonium-239	-0.0054	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Ruthenium-106	0.161	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Sodium-22	-0.0146	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Strontium-90	0.161	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Uranium-234	0.0045	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Uranium-235	0.0091	pCi/g	U
21-02-19791	MD21-02-45875	11–13	Fill	Uranium-238	0.0057	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Americium-241	0.0921	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Cesium-134	0.0132	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Cesium-137	0.0186	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Cobalt-60	0.0266	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Europium-152	-0.0141	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Plutonium-238	-2E-10	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Plutonium-239	0.0014	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Ruthenium-106	-0.0786	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Sodium-22	0.0098	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Strontium-90	-0.0177	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Uranium-234	0.0149	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Uranium-235	-0.0015	pCi/g	U
21-02-19791	MD21-02-45876	11–13	Fill	Uranium-238	4E-10	pCi/g	U

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19791	MD21-02-45854	15–17	Fill	Americium-241	-0.163	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Cesium-134	-0.0228	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Cesium-137	0.0026	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Cobalt-60	0.0253	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Europium-152	0.117	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Plutonium-238	0	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Plutonium-239	-0.0026	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Ruthenium-106	-0.0169	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Sodium-22	0.0477	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Strontium-90	0.0668	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-234	0.0083	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-235	0.0041	pCi/g	U
21-02-19791	MD21-02-45854	15–17	Fill	Uranium-238	0.0055	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Americium-241	-0.228	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Cesium-134	-0.0137	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Cesium-137	0.0173	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Cobalt-60	0.0385	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Europium-152	-0.0496	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Plutonium-238	0.0091	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Plutonium-239	-0.0052	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Ruthenium-106	-0.0533	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Sodium-22	0.0636	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Strontium-90	-0.0041	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Uranium-234	0.0148	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Uranium-235	-0.003	pCi/g	U
21-02-19791	MD21-02-45877	15–17	Fill	Uranium-238	0.0044	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Americium-241	-0.057	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Cesium-134	-0.0533	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Cesium-137	0.0217	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Cobalt-60	-0.0242	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Europium-152	0.0491	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Plutonium-238	-0.0011	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Plutonium-239	-0.0057	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Ruthenium-106	0.118	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Sodium-22	0.0055	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Strontium-90	0.0756	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Uranium-234	-0.0024	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Uranium-235	-0.0024	pCi/g	U
21-02-19791	MD21-02-45878	15–17	Fill	Uranium-238	-0.0036	pCi/g	U

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45856	14–16	Fill	Americium-241	-0.0932	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Cesium-134	-0.0213	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Cesium-137	-0.0433	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Cobalt-60	0.0227	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Europium-152	0.0332	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Plutonium-238	-0.0014	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Plutonium-239	0.0029	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Ruthenium-106	0.18	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Sodium-22	0.023	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Strontium-90	0.0575	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-234	0.0094	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-235	-0.0021	pCi/g	U
21-02-19792	MD21-02-45856	14–16	Fill	Uranium-238	5E-10	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Americium-241	-0.241	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Cesium-134	-0.0381	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Cesium-137	-0.0149	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Cobalt-60	0.0212	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Europium-152	-0.0217	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Plutonium-238	0.0052	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Plutonium-239	0.0026	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Ruthenium-106	-0.0615	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Sodium-22	0.0191	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Strontium-90	0.118	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Uranium-234	0	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Uranium-235	0.0027	pCi/g	U
21-02-19792	MD21-02-45884	14–16	Fill	Uranium-238	0.0081	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Americium-241	0.0302	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Cesium-134	-0.0111	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Cesium-137	0.003	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Cobalt-60	-0.0252	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Europium-152	-0.0374	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Plutonium-238	-0.0012	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Plutonium-239	-0.0023	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Ruthenium-106	-0.336	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Sodium-22	0.047	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Strontium-90	0.16	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Uranium-234	-0.0028	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Uranium-235	0.007	pCi/g	U
21-02-19792	MD21-02-45885	14–16	Fill	Uranium-238	-0.0014	pCi/g	U

Table D-2.0-6 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result	Units	Qualifier
21-02-19792	MD21-02-45857	16–17.7	Fill	Americium-241	-0.0885	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cesium-134	-0.0416	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cesium-137	-0.0338	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Cobalt-60	-0.0502	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Europium-152	0.0619	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Plutonium-238	0.0014	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Plutonium-239	-0.0111	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Ruthenium-106	-0.0324	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Sodium-22	0.0016	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Strontium-90	0.0856	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-234	-0.0039	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-235	-0.0039	pCi/g	U
21-02-19792	MD21-02-45857	16–17.7	Fill	Uranium-238	0.0013	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Americium-241	-0.299	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Cesium-134	0.0384	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Cesium-137	0.0052	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Cobalt-60	0.0057	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Europium-152	0.0979	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Plutonium-238	0.0036	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Plutonium-239	-0.0026	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Ruthenium-106	-0.286	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Sodium-22	-0.0006	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Strontium-90	0.0217	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Uranium-234	0.0022	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Uranium-235	0.0023	pCi/g	U
21-02-19792	MD21-02-45886	16–17.7	Fill	Uranium-238	-0.0045	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Americium-241	-0.429	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Cesium-134	-0.0081	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Cesium-137	-0.0004	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Cobalt-60	0.0464	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Europium-152	-0.0779	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Plutonium-238	0.0059	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Plutonium-239	0	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Ruthenium-106	0.184	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Sodium-22	-0.0373	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Strontium-90	-0.0277	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Uranium-234	0	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Uranium-235	-0.0023	pCi/g	U
21-02-19792	MD21-02-45887	16–17.7	Fill	Uranium-238	-0.0057	pCi/g	U

Table D-3.0-1
Average Metals Emission Concentrations and Rates, NTISV Hot Demonstration

Analyte	Average[a] Emission Concentration (µg/dscm)[b]	Average[a] Emission Rate (mg/min)[c]
Antimony	0.208	0.010
Arsenic	0.079	0.004
Barium	~ 0.171[d,e]	~ 0.008
Beryllium	~ 0.011	~ 0.001
Cadmium	0.150	0.007
Cobalt	0.070	0.003
Chromium	0.195	0.010
Copper	0.405	0.019
Mercury	16.9	0.816
Manganese	0.133	0.006
Nickel	0.548	0.027
Phosphorus	~ 0.081	~ 0.004
Lead	~ 0.163	~ 0.008
Selenium	0.926	0.044
Silver	0.288 U[f,g]	0.014 U
Thallium	0.029 U	0.001 U
Zinc	3.71	0.174

[a] Average of two 360-min tests.

[b] µg/dscm = Micrograms of analyte collected per dry standard cubic meter of gas.

[c] mg/min = Milligrams of analyte emitted per minute.

[d] If one of the two test measurements was below the reporting limit, it was counted as zero and the average result flagged with a "~."

[e] ~ = Value is approximate because one of the two measurements was below the reporting limit.

[f] If both test measurements were below reporting limit, the average value was flagged "U."

[g] U = not detected at reporting limit in either measurement.

Table D-3.0-2
Average Radionuclide Emission Concentrations and Rates, NTISV Hot Demonstration

Analyte[a]	Average Minimum Detectable Activity	Average[b] Emission Concentration (pCi/dscm)[c]	Average[b] Emission Rate (µCi/hr)[d]
Americium-241	0.58	0.078 U[e,f]	0.0002 U
Cesium-137	737	100.4 U	0.294 U
Plutonium-238	0.14	0.019 U	0.00006 U
Plutonium-239/240	0.08	0.010 U	0.00003 U
Uranium-234	0.16	~ 0.014[g,h]	~ 0.00004
Uranium-235	0.16	0.022 U	0.00006 U
Uranium-238	0.21	~ 0.011	~ 0.00004
Tritium	337.6	3701.8	10.5

[a] Except for tritium, all analytes were measured on the filter. Tritium was measured in the condensate.
[b] Average of two 360-min tests.
[c] pCi/dscm = Picocuries collected per dry standard cubic meter of sample.
[d] µCi/hr = Microcuries of analyte emitted per hour.
[e] Average value was flagged "U" if both test measurements were below minimum detectable activity (MDA).
[f] U = Not detected at MDA in either measurement.
[g] If one of the two test measurements was below MDA, it was counted as zero and the average result flagged "~."
[h] ~ = Value is approximate because one of the two measurements was below the MDA.

Appendix E

Demonstration and Unit Treatment Costs

The nontraditional in situ vitrification (NTISV) hot demonstration at Los Alamos National Laboratory (the Laboratory) was funded from several sources and over a period of several years. The original demonstration, as funded by the US Department of Energy (DOE), had a budget of approximately $2.5 million. This budget included the mobilization and demobilization costs, equipment, and the actual vitrification at material disposal area (MDA) V. This budget also included management costs incurred by MSE Technology Applications, Inc., which received the funding from DOE and oversaw the hot demonstration.

Additional funding came from the Laboratory. Approximately $120,000 was expended during fiscal year (FY) 2000 for site support during the demonstration, such as health and safety and facility interaction. Another $100,000 was spent creating the IM plan, managing wastes, conducting site restoration, and producing a preliminary interim measure (IM) report from FY2000 to FY2001. During FY2002, when the glass had cooled adequately for drilling, approximately $280,000 was spent on coring, sampling, and fixed laboratory analyses. Mineralogy and final reporting costs, incurred during FY2003, are estimated to be $120,000.

Because the NTISV hot demonstration was a relatively small-scale demonstration (relative to the size of MDA V as a whole) and because there were many costs associated with the demonstration that would not be incurred during actual treatment (e.g., temperature monitoring, coring, and some of the analytical and mineralogy), it is difficult to develop an accurate unit cost for use of this technology at MDA V. The estimated melt size is 20 x 30 x 10 ft thick, or 222 cu yd. Assuming 35% volume reduction, the actual treatment volume was 342 cu yd. Using the budget of the company that produced the melt (formerly Geosafe, now AMEC) to represent actual vitrification costs, a unit cost of approximately $3,757/cu yd is obtained ($1,284,947/342 cu yd). This amount does not accurately reflect the unit cost of vitrification for MDA V. There would be significant economy of scale because fixed price items such as mobilization and demobilization (approximately half AMEC's total budget) would not change with the increased volume treated. However, it is unlikely that the unit cost of NTISV at MDA V would compare favorably with the cost of excavation and disposal of the absorption bed materials as low-level waste. If absorption bed materials at MDA V were classified as mixed waste, the NTISV technology would compare much more favorably from a cost standpoint.

Appendix F

Interim Measure Plan

LA-UR-99-3406
February 2000

Interim Measure Plan for Consolidated Potential Release Site 21-018(a)-99

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program
ER19990009

Los Alamos
NATIONAL LABORATORY
Los Alamos, NM 87545

Produced by the Material Disposal Areas Focus Area

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1.0 RATIONALE AND OBJECTIVE OF INTERIM MEASURE

This interim measure (IM) plan proposes an approach for the demonstration of nontraditional in situ vitrification (NTISV) technology at a potential release site (PRS) located in Technical Area (TA) 21 at Los Alamos National Laboratory (the Laboratory) (Figure 1.0-1). The demonstration will take place in the northemmost absorption bed at consolidated PRS 21-018(a)-99, Material Disposal Area (MDA) V. MDA V is a solid waste management unit listed in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

1.1 Rationale for Proposed Interim Measure

The Environmental Restoration (ER) Project performed two previous sampling efforts at MDA V as part of the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI). However, data were insufficient to determine the extent of radioactive contamination, and MDA V is recommended by the ER Project for further investigation to fill remaining data gaps (LANL 1996, 54969.2).

The Department of Energy (DOE) recently made funding available for a demonstration of in situ stabilization. DOE/the Laboratory and the New Mexico Environment Department (NMED) reached an agreement on March 4, 1999, to conduct a demonstration of NTISV at MDA V (Figure 1.1-1) to obtain data on the effectiveness of the technology. Both parties also agreed that the hot demonstration could be most effectively regulated as an IM.

The NTISV demonstration is divided into two phases: a *cold* demonstration in an area that has no radioactive contaminants and a *hot* demonstration at a contaminated area within MDA V. This IM plan addresses the second phase, the hot demonstration. The cold demonstration was completed as a voluntary corrective measure (VCM) in April 1999 and is summarized in Section 3.0.

1.2 Objective of the Interim Measure

The primary objective of this IM is to obtain data on the effectiveness of NTISV and to demonstrate whether or not NTISV would be a suitable remedial alternative for all of MDA V. If the results demonstrate that NTISV is a viable technology for this site, it may be considered as a final remedy after the completion of the RFI. The NTISV technology may also be considered as a final remedy for other sites with similar characteristics and conditions. Other objectives of this demonstration are to

- use information and data gathered from the cold demonstration to optimize the performance and technical value of the hot demonstration,
- evaluate the vitrified mass to determine the product durability and product homogeneity, and
- evaluate the subsurface fugitive emissions beyond the protected zone under the off-gas hood.

2.0 SITE DESCRIPTION AND CHARACTERIZATION DATA

2.1 Site Type and Description

From 1945 to 1978, TA-21 was primarily used for plutonium research, metal production, and related activities. Because the major industrial activity at TA-21 involved plutonium production, the major waste disposal activities were related to plutonium process wastes.

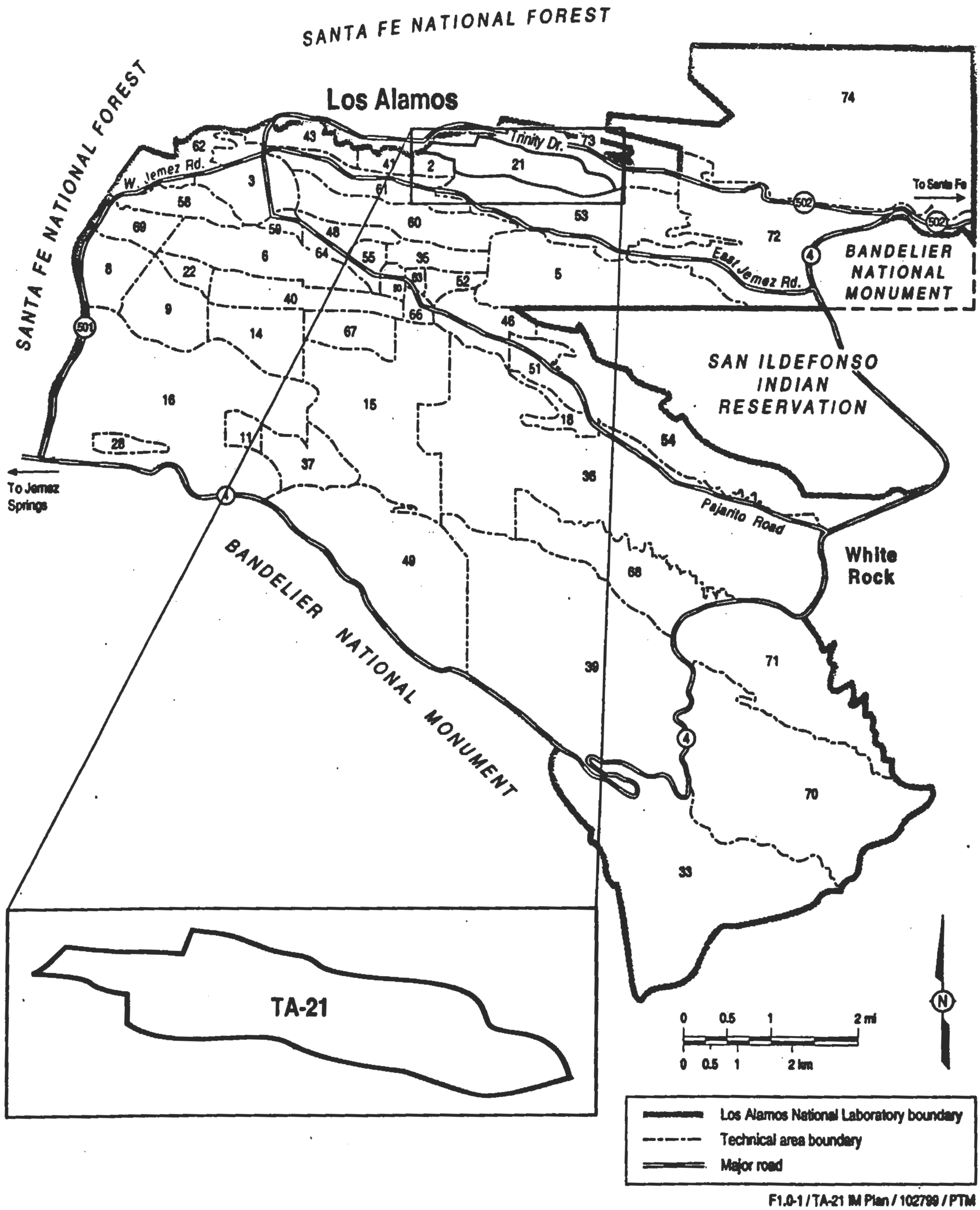
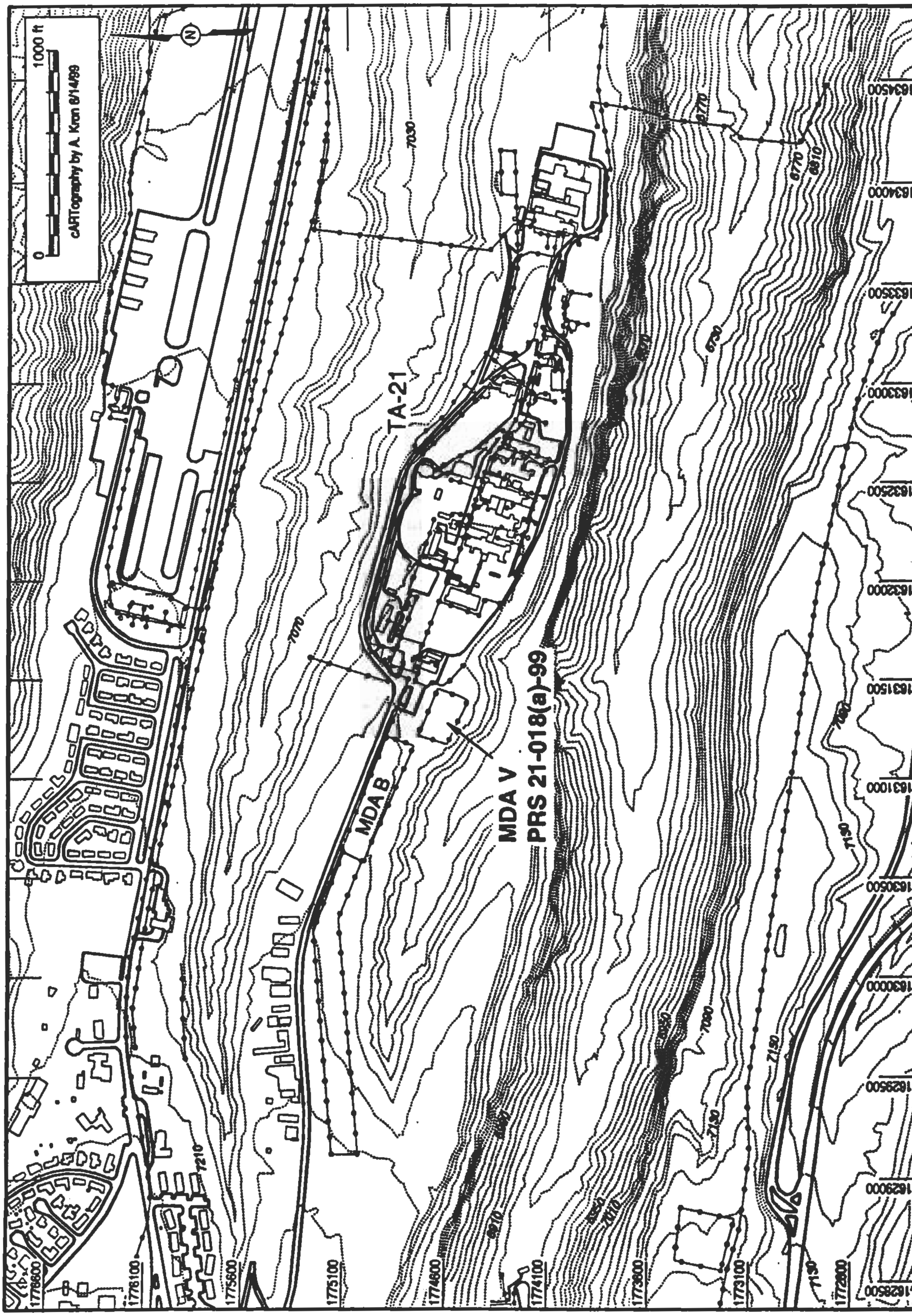


Figure 1.0-1. Location of TA-21 with respect to Laboratory TAs and surrounding land holdings



Source: FIMAD 1995, G103591

F1.1-1/TA-21 IM Plan/110899/PTM

Figure 1.1-1. Location of MDA V, consolidated PRS 21-018(a)-99, NTISV hot demonstration area

MDA V is located on the west end of DP Mesa on a 0.88-acre site and contains three cobble- and gravel-filled pits or absorption beds. The absorption beds were constructed to dispose of wastewater from the DP laundry facility [former PRS 21-018(b), currently part of consolidated PRS 21-018(a)-99] located in Building TA-21-20 and, for a short time, waste from Building TA-21-45 (PRS C-21-015), a former waste treatment laboratory (Figure 2.1-1). The DP laundry facility, TA-21-20, was built in 1945 and operated until 1961. It was used to wash personal protective clothing and other items of clothing used in research related to the post-Manhattan Project nuclear weapons development and the production of uranium and plutonium metals at TA-21. Water from the washing machines was discharged to the MDA V absorption beds. The waste treatment laboratory (TA-21-45) was used to study various waste streams in an attempt to recover more plutonium and uranium as well as other valuable and scarce materials.

The RFI work plan (LANL 1991, 7529, Section 16.7) and engineering drawing ENG-C-2218 (LASL 1953, 24463) indicate absorption bed 1 was connected to the laundry facility by a 6-in. iron drainpipe, which connected to a 4-in. iron distribution pipe that was placed on the bottom of the absorption bed. According to the drawing, the distribution pipe had five openings along the length of the pipe allowing water to flow into the bed. The ends of the distribution pipe were open as well. On the south side of absorption bed 1, a similarly constructed 4-in. collection pipe was connected to two overflow pipes leading to a distribution pipe in absorption bed 2 and absorption bed 3. The design was intended to allow the first bed to fill with water to a depth of approximately 24 in. from the bottom of the absorption bed before the overflow pipes would carry water to the next absorption bed. The pipes in all three absorption beds were covered with approximately 24 in. of 3-in.- to 12-in.-diameter cobbles; the cobbles were covered with 12 in. of gravel; and the gravel was covered with 12 in. of earth or crushed tuff. Each absorption bed was bermed on the downgradient (south) side with a minimum 12 in.-high by 72 in.-wide embankment.

The absorption beds were designed using an assumed percolation rate of 0.5 gal. per ft^2 per day (Veltman 1945, 1305), which allowed for disposal of a volume of 8250 gal. per day of wastewater. More recent estimates suggest that saturated conductivity or percolation rates were actually much less, approximately 0.125 gal. per ft^2 per day (Abeele et al. 1981, 6273). In addition, wastewater volumes are estimated to have been much greater than planned, in the range of 22,710 to 30,280 gal. per day (2 million gal. per year or 40 million gal. over the operating life of the DP laundry facility). One reference indicates that as early as 1946 the absorption beds were observed to "not be functioning properly and a large amount of contaminated water was lying above the ground in the pits" (Drager 1946, 1562). Another reference states "The volume that reached pit 3 is not known but is believed to be relatively small, although at one time the water was reported to have overflowed pit 3" (Abrahams 1962, 8147). Aerial photos of MDA V taken in the 1950s show water on the surface of bed 3. The overestimated percolation rate combined with an underestimation of wastewater volumes resulted in a disposal system that could not handle the volume of wastewater generated by DP laundry operations.

After the RFI work plan was written, information was obtained that indicated that TA-21-45 was used from 1950 to 1953 as a laboratory for research on treatment of industrial wastes (Francis 1999, 63095). TA-21-45 was remodeled in 1949 to supply additional facilities for the Industrial Waste Studies Group (Francis 1999, 63095). When the RFI work plan for TA-21 was prepared, the existence of the TA-21-45 waste treatment research facility was not known; it was also not known that there was a piping connection between building TA-21-45 and absorption bed 1. Engineering drawing (Francis 1999, 63095, Attachment 3) shows that a 0.75-in. line ran from a sump in building TA-21-45 through building TA-21-20 (laundry) into absorption bed 1. Pumps, pipes, and valves were installed to move liquids from the sump to absorption bed 1.

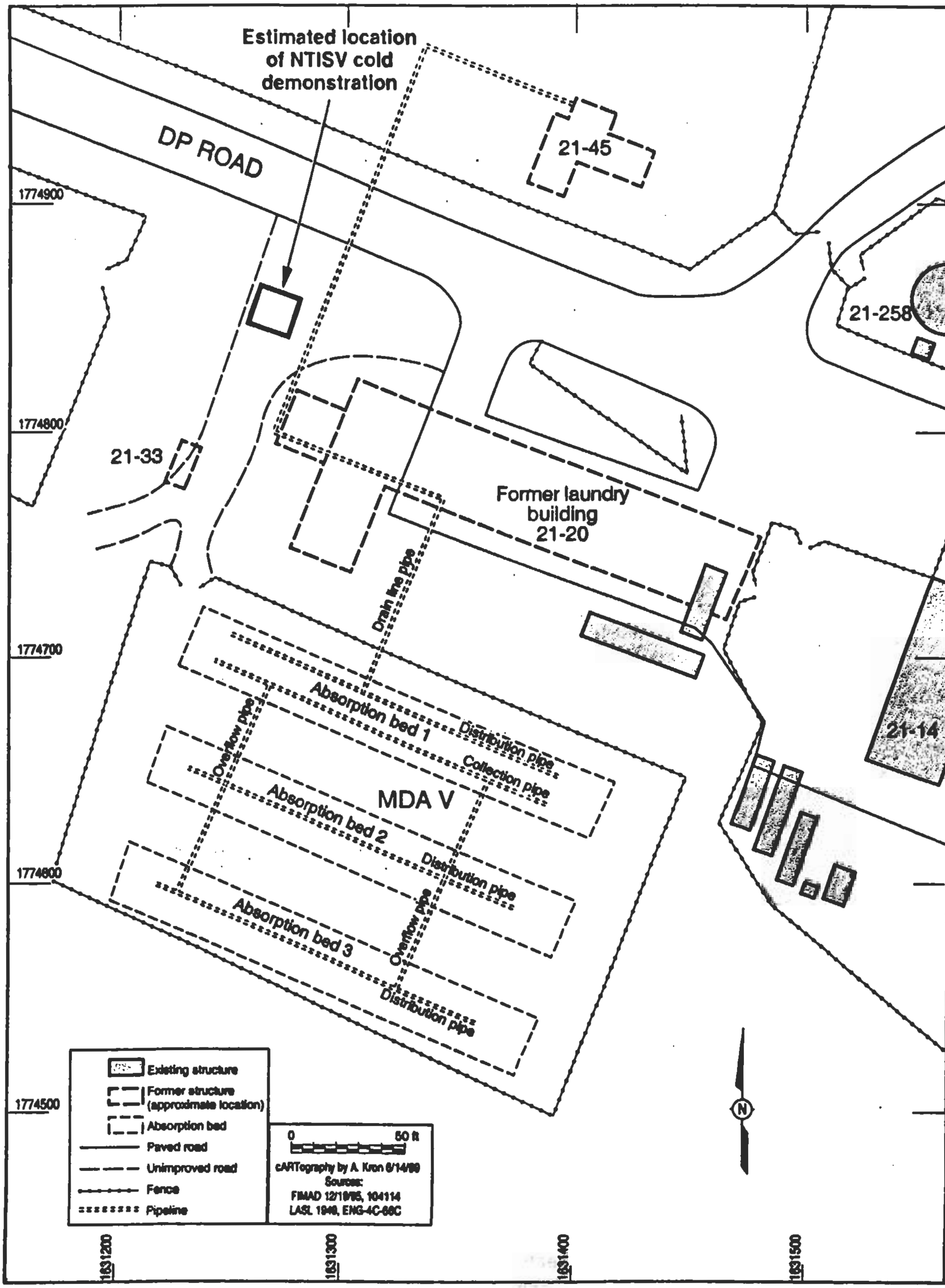


Figure 2.1-1. Site map with absorption bed locations

2.2 RFI Historical Information

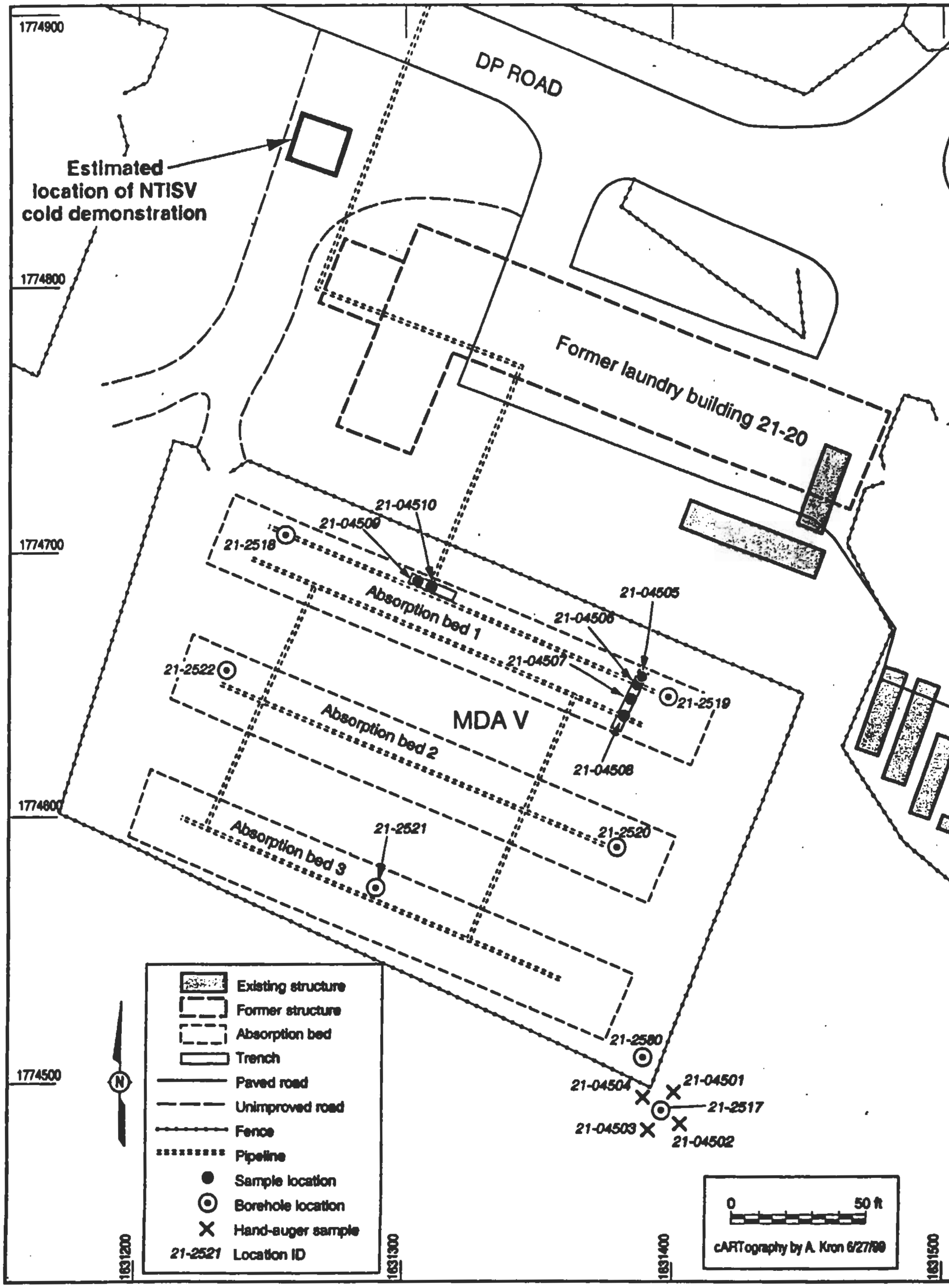
Early radiological analyses and surveys indicate that radioactive materials were present in the DP laundry facility, building TA-21-20. Beginning in 1946, analyses of the effluent indicated that elevated levels of alpha- and beta-emitting radionuclides were present. Surface soil samples collected in 1954 showed relatively high levels of plutonium. The quality of these data is unknown; they were obtained using early radiochemistry methods.

The objective of the MDA V RFI sampling was to define the extent of source term migration. The Phase I RFI at MDA V consisted of three sampling events: July 1994, August to September 1994, and May 1996. This work was performed in accordance with the approved work plan for TA-21 (LANL 1991, 7529, Section 16.7).

In 1994, geodetic and radiation surveys were conducted at MDA V. The geodetic survey was used to locate the approximate center line and corners of each absorption bed and the potential borehole locations. An initial ground surface survey was performed to determine if any areas of elevated radioactive levels were present that might be a health and safety concern to personnel working on site and to reposition any borehole locations to areas with surface contamination. The 1994 field work was divided into two sampling events. The first sampling event consisted of drilling two boreholes in absorption bed 1 and one borehole in absorption bed 2. Analytical results indicated the only volatile organic compounds (VOCs) present in the first round of sampling were carbon disulfide and styrene, and therefore, VOCs were not analyzed for in the second round. During the second round of sampling, one borehole was drilled in absorption bed 2, another was drilled in absorption bed 3, and one was drilled outside of the absorption beds to the southeast (Figure 2.2-1). (Borehole 21-2580 was supposed to be located outside bed 3 and downgradient of MDA V. After drilling approximately 5 ft, the cobble zone at the bottom of bed 3 was encountered. The drilling was stopped at 10 ft, and a sample was collected. Another borehole [21-2517] was then drilled outside the perimeter fence of MDA V.) Six of the boreholes were located within the boundaries of the absorption beds, and one was located outside the absorption beds on the southeast side of the MDA. The boreholes in the absorption beds were located with the intent of assessing whether there was variability of contaminant deposition that could be a result of the expected wastewater flow paths. A 2-ft zone of no core recovery in the cobble layer was encountered in the bottom of the absorption beds.

In 1996, a geophysical survey was performed, additional subsurface samples (1–1.5 ft deep) were collected near the borehole located outside the boundaries of the absorption beds, and two trenches were excavated in absorption bed 1 (Figure 2.2-1). One trench was excavated across the east end of absorption bed 1, and samples were collected at four locations within the trench. A second trench was excavated parallel to absorption bed 1 at the point where the geophysical survey identified the drain line from the DP laundry facility, and samples were collected at two locations within the trench. The purpose of this sampling was to provide additional data on the construction of the absorption beds and on levels of contaminants within the cobble layer at the bottom of absorption bed 1.

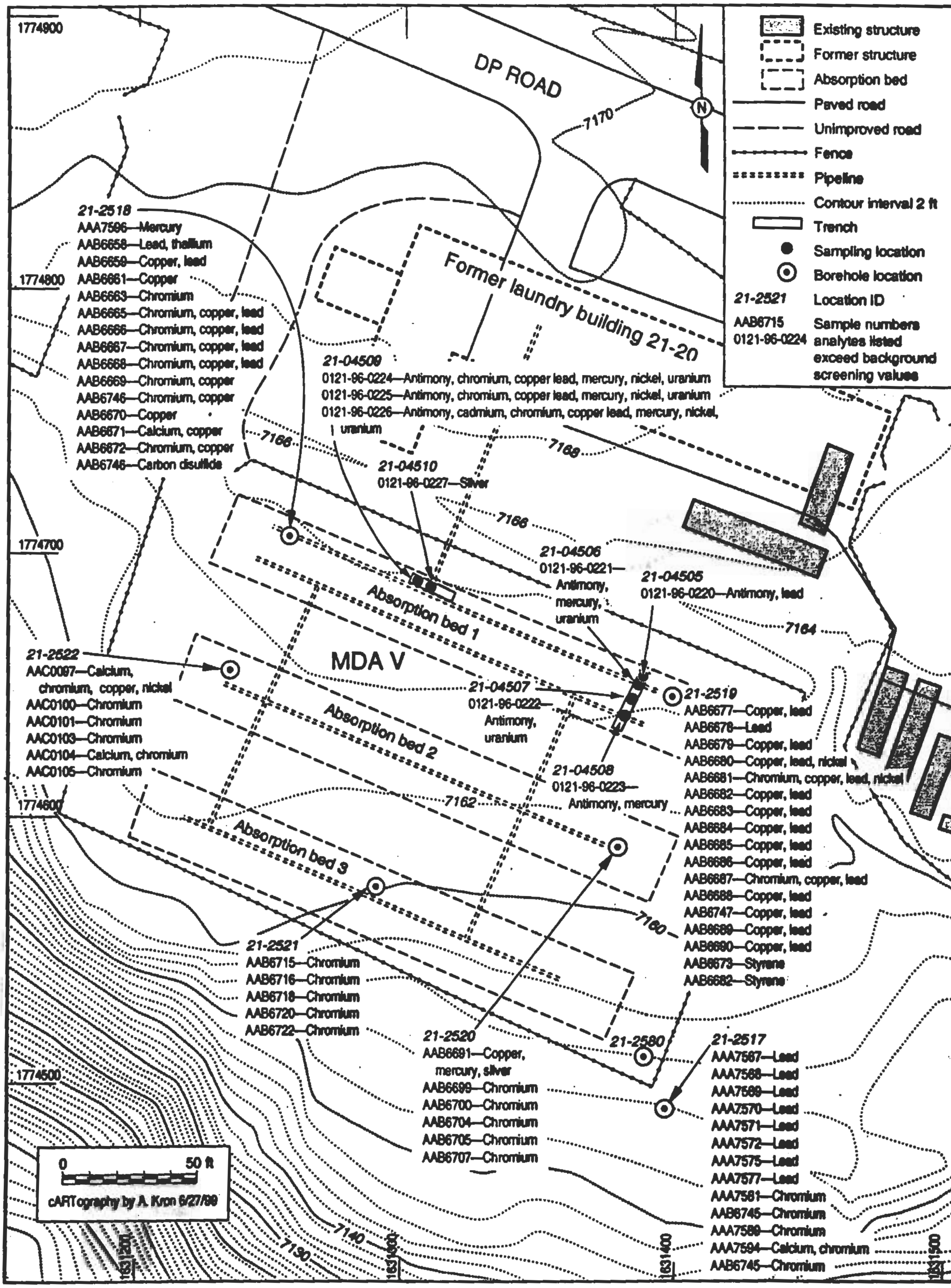
The following results are from both the 1994 and 1996 sampling events. Six inorganic chemicals were detected at concentrations greater than upper tolerance limits (UTLs): antimony, cadmium, copper, lead, mercury, and uranium. Nine radionuclides were detected at concentrations greater than UTLs: americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, and uranium-238. Two VOCs were detected: carbon disulfide and styrene. Figure 2.2-2 depicts inorganic chemicals detected at greater than background screening values. Figure 2.2-3 depicts radionuclides detected at greater than screening action levels (SALs). The radionuclide concentrations greater than SALs in absorption bed 1 appear to be concentrated generally in the cobble layer from 3.5 ft to 7 ft deep. Data summary tables and detailed sampling activities and conclusions are provided in the RFI report for MDA V (LANL 1996, 54969.2).



Source: FIMAD 12/19/95, 104114

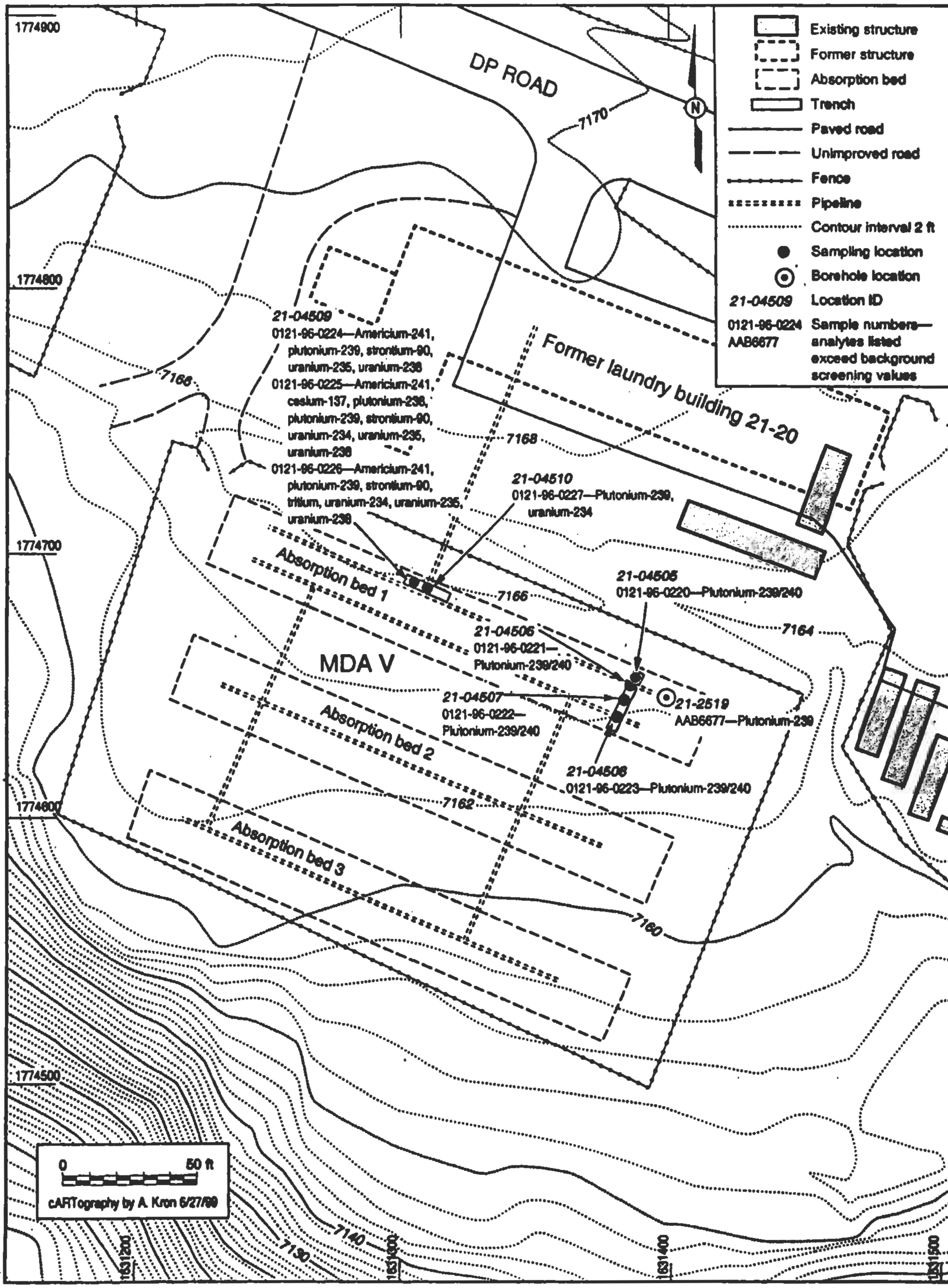
F2.2-1 / TA-21 IM Plan / 102799 / PTM

Figure 2.2-1. Former sampling locations at MDA V



Source: FIMAD 104114 12/19/95 F2.2-2 / TA-21 IM Plan / 020100 / PTM

Figure 2.2-2. Inorganic chemical analytes above background screening values



Source: FIMAD 104114 12/19/95

F 2.2-3 / TA-21 IM Plan / 102799 / PTM

Figure 2.2-3. Radionuclides with concentrations in soil that exceed background screening values at MDA V

3.0 NTISV COLD DEMONSTRATION RESULTS

The cold demonstration results are summarized here to provide information that was used to optimize the hot demonstration. Evaluation of the cold demonstration results led to the enhancements discussed in Section 5.1.

Performance criteria for the cold demonstration included determination of the product durability, product homogeneity, and whether or not the target depth was achieved. Samples of the vitrified product were submitted for analyses by toxic characteristic leach procedure (TCLP) and the product consistency test (PCT) (ASTM 1998, 64040). The TCLP test determines product durability, and the PCT determines the durability of the glass (cesium carbonate and cerium oxide) throughout the vitrified product. Physical measurements of the subsidence volume and the volume of the vitrified product were obtained during excavation of the glass; the measurements were used to determine if the target depth of 22 ft was achieved. Details of the cold demonstration results can be found in the final report "Cold Demonstration of Non-Traditional In Situ Vitrification at the Los Alamos National Laboratory" (MSE-TA 1999, 64804).

Subsidence Volume. The reduction created as a result of processing the simulated absorption bed and the soil beneath it resulted in a subsidence of approximately 9 ft in the center and an average of 7.5 ft overall. The volume reduction was 33% for the cold demonstration.

Vitrified Glass Size and Shape. Determination of whether or not all of the simulated absorption bed had been treated was of primary importance during excavation of the vitrified product. Visual inspections of the material excavated from the top of the glass verified that materials from the simulated absorption bed did not remain above the vitrified product. Only a small amount of soil and gravel from the layer of overburden was found on top of the vitrified product. Measurement of the top of the monolith in the north/south direction was 23 ft; in the east/west direction, it was 25 ft.

The top of the vitrified glass exhibited a shallow bowl shape that was probably created by trapped gases released slowly during the melting process. The north and west sides of the vitrified product were exposed to determine the side profile. The shape of the monolith was approximately a square block with a slightly rounded top. The shape of the monolith was typical, and no abnormalities associated with the shape were identified from the visual observations of the two sides that were exposed. The bottom of the vitrified product was not exposed, but it is expected to be relatively flat with an upside down bowl shape.

Vitrified Glass Depth. A depth objective of 22 ft was established for the cold demonstration. The final depths of the electrodes ranged between 22 ft 10 in. and to 23 ft 4 in., which correlates to the bottom of the vitrified glass.

Vitrified Glass Sampling. After exposing the vitrified glass, an excavator with a hydraulic hammer was used to break pieces of the glass from the northwest quadrant of the monolith. Glass samples were submitted for analyses.

Bulk Chemistry Testing. Five vitrified product samples were collected and submitted for analysis by inductively coupled plasma atomic emission spectroscopy (ICPAES) to determine bulk chemistry. The results are presented in Table 3.0-1. The composition of the vitrified product consists of 90% silica dioxide and aluminum oxide.

Table 3.0-1
Postdemonstration Glass Product Sample Bulk Chemistry Results (Normalized)

Oxide Compound	NTISV-GB-12 (wt %)	NTISV-GB-18 (wt %)	NTISV-GB-20 (wt %)	NTISV-GB-23 (wt %)	NTISV-GB-26 (wt %)	Average (wt %)
Sodium monoxide (Na_2O)	3.63	3.63	3.59	3.64	3.57	3.61
Potassium oxide (K_2O)	3.65	3.66	3.66	3.66	3.66	3.67
Magnesium monoxide (MgO)	0.44	0.41	0.45	0.44	0.48	0.44
Manganese monoxide (MnO)	0.06	0.06	0.06	0.06	0.06	0.06
Calcium monoxide (CaO)	0.88	0.84	0.90	0.90	0.98	0.90
Phosphorus pentoxide (P_2O_5)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichromium trioxide (Cr_2O_3)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium (IV) dioxide (TiO_2)	0.20	0.20	0.21	0.20	0.20	0.20
Ferric oxide (Fe_2O_3)	1.49	1.48	1.40	1.43	1.55	1.47
Aluminum oxide (Al_2O_3)	12.38	12.45	12.60	12.56	12.79	12.56
Silica dioxide (SiO_2)	77.25	77.19	77.11	77.09	76.67	77.06
Total	100.0	100.0	100.0	100.0	100.0	100.0

Homogeneity of the Radionuclide Surrogate Distribution. Five random samples were collected from the edge, center, and upper portion of the vitrified product and submitted for inductively coupled plasma mass spectroscopy (ICPMS) analysis for cesium and cerium. The amounts of cesium and cerium added to the simulated adsorption bed were approximately 2 times the background concentrations for cerium and 10 times for cesium. These levels would allow for evaluation of the distribution of the surrogates throughout the vitrified product after completion of the melt. The results are presented in Table 3.0-2. The increases of cerium and cesium surrogates in the vitrified product were 2.2 times and 14 times, respectively, above background concentrations. The concentrations of both surrogates within the vitrified glass are an indicator of immobilization of these compounds within the glass.

Table 3.0-2
Results of Radionuclide Surrogate Analyses in the Vitrified Product

Sample Number	Cesium (ppm)*	Cerium (ppm)
NTISV-GB-12	33.3	249
NTISV-GB-18	33.0	249
NTISV-GB-20	32.9	249
NTISV-GB-23	33.4	252
NTISV-GB-26	30.9	241
Average in vitrified product	33 ± 0.7	248 ± 3
Average background value in tuff before demonstration	2.3 ± 0.2	111 ± 3

* ppm = parts per million.

Product Quality Testing. Two different leaching tests, TCLP and PCT, were used to determine the durability of the vitrified product. The product durability is measured by its resistance to leaching. Five samples were randomly collected and submitted for analyses.

- *PCT Results.* The PCT method (ASTM 1998, 64040) was developed to evaluate the durability of high-level waste glasses. This method can also be used to evaluate simulated waste glass.

Results are presented in Table 3.0-3. The cesium and cerium in the leachate were less than the detection limits of the analytical procedure for all samples. This suggests the vitrified glass product has good leach resistance and durability for this waste form.

- *TCLP Results.* The TCLP test determines the mobility of inorganic (and organic) compounds in liquid, solid, and/or multiphase wastes. The five samples used for the PCT analyses were used for the TCLP testing. The TCLP results indicated that cesium or cerium were not detected above the detection limits. This suggests the vitrified glass product has good leach resistance and durability for this waste form.

Table 3.0-3
PCT Results for the Cold Demonstration Product

Sample	Average Cesium In Vitrified Product (ppm)	Cesium In Leachate (ppm)	Cesium Mobilized (wt %)	Normalized Cesium Release (g/m^2)	Average Cerium In Vitrified Product (ppm)	Cerium In Leachate (ppm)	Cerium Mobilized (wt %)	Normalized Cerium Release (g/m^2)
GB-1	33±0.7	<0.002	<0.006	<0.011	248 ± 3	<0.006	<0.002	<0.036
GB-3	33±0.7	<0.002	<0.006	<0.011	248 ± 3	<0.006	<0.002	<0.036
GB-4	33±0.7	<0.002	<0.006	<0.011	248 ± 3	<0.006	<0.002	<0.036
GB-6	33±0.7	<0.002	<0.006	<0.011	248 ± 3	<0.006	<0.002	<0.036
GB-7	33±0.7	<0.002	<0.006	<0.011	248 ± 3	<0.006	<0.002	<0.036

Geochemical Evaluation. An electron microprobe analysis in combination with x-ray energy dispersive spectroscopy and wavelength dispersive spectroscopy were used to evaluate microscopic features and facilitate quantitative analysis of features within the vitrified product. The one sample of vitrified product that was evaluated contained glass, elemental iron, and small black particles thought to be carbon. The low concentration of iron in the glass compared to the rock composition of the materials in the simulated absorption bed suggest that the iron oxide present in the materials was reduced to elemental iron. The reduction of iron was probably caused by the distribution of carbon in the melt.

4.0 SUCCESS CRITERIA

The performance criteria for the hot demonstration include determination of the vitrified product durability, physical configuration of the vitrified product, homogeneity of contaminants within the melt, and characterization of the vitrified product. Product durability, which is measured by its resistance to leaching, will be determined by analyzing the glass by TCLP and PCT analysis. The physical configuration will be evaluated by comparison of premelt and postmelt tomography results, electricity consumption, and electrode depths. The product homogeneity and characterization of the product will be determined by different analytical methods such as x-ray diffusion (XRD), optical polarization microscope, x-ray fluorescence (XRF), ICPAES, scanning electron microscopy (SEM), and electron-beam microprobe analysis (EMPA). Details are presented in Section 7.1.

5.0 PREDEMONSTRATION ACTIVITIES

5.1 Description of the Proposed Interim Measure

All activities will be performed under a site-specific health and safety plan (LANL, in preparation), which will be developed in accordance with the ER Project health and safety plan (Environmental Restoration

Project 1998, 58714). The NTISV hot demonstration will be performed on a 20-ft x 30-ft x 22-ft portion of absorption bed 1 (Figure 5.1-1). For this demonstration, Geosafe will be using the planar ISV process, which is an adaptation to conventional ISV (Geosafe Corporation 1999, 63039; MSE-TA 1999, 64804). The planar ISV process was performed at the NTISV cold demonstration site and is described in detail in the VCM plan for consolidated PRS 21-027(d)-99 (LANL 1999, 63182). The NTISV hot demonstration of a portion of MDA V absorption bed 1 will require approximately 12 days (288 hr) of operation to achieve the required results.

Hot Demonstration Site Preparation. Preparation activities for the hot demonstration include clearing and grubbing the work area, removing the fence, disconnecting and capping the absorption bed 1 distribution and collection pipes, removing the abandoned water drainline west of absorption bed 1, predemonstration drilling and sampling, dynamic disruption of surrounding tuff, installing boreholes for tomography testing, collecting predemonstration tomography data, and installing starter planes, electrodes, and thermocouples. Then the hood will be aligned over the demonstration area, the off-gas piping and electrical and instrument cables will be connected, and each component will be tested for operability. Next, a complete system checkout and a management walkthrough will be performed to ensure readiness; if they indicate readiness, the melting process will be initiated. A graduated power-up schedule will be employed that allows the starter planes to heat up and begin melting soil and materials in a controlled fashion. As the melt volume grows, the power level is increased to continue the melting process.

Hot Demonstration Enhancements. In response to the analysis of data obtained from the cold demonstration, the following optimizations will be incorporated for the hot demonstration.

- The configuration of the electrode planes will be adjusted to a more optimal electrode and starter plane separation.
- For more stable electrodes and greater processing efficiency, the electrode depths will be increased.
- A gas-fired preheater will be installed between the hood and the high-efficiency particulate air (HEPA) prefilter in order to heat the off-gas air emissions stream to a temperature above its dew point. This will preclude the possibility of condensation within the HEPA filters, which leads to premature demise of the HEPA filters. Also, the condensate accumulation within the prefilter housing will be reduced.
- A vacuum-driven drainage system will be installed on the prefilter housing and condenser section. This system will enable the operations crew to drain any condensate that does occur in a manner that will not breach off-gas system integrity.
- A system to allow additional overburden material (gravel) to be placed over the vitrification zone during operations will be implemented. This system will allow the operations crew to maintain overburden integrity as the vitrification zone subsides.
- The electrode contactors have been redesigned to improve their ability to maintain electrical contact in the event the electrodes are not perfectly vertical.
- The electrode hood seals have been redesigned to better allow for electrode movement.
- All control electronics (e.g., process control computers, etc.) will be protected by an uninterruptible power supply. This will ensure that there will be no loss of computer control continuity in the event of power disruptions.
- Dynamic disruption will be used throughout the entire vitrification volume as opposed to only the periphery. This will increase processing efficiency and allow for the unimpeded egress of gasses and vapors.
- The data acquisition system has been overhauled to perform better in an electrically noisy environment.

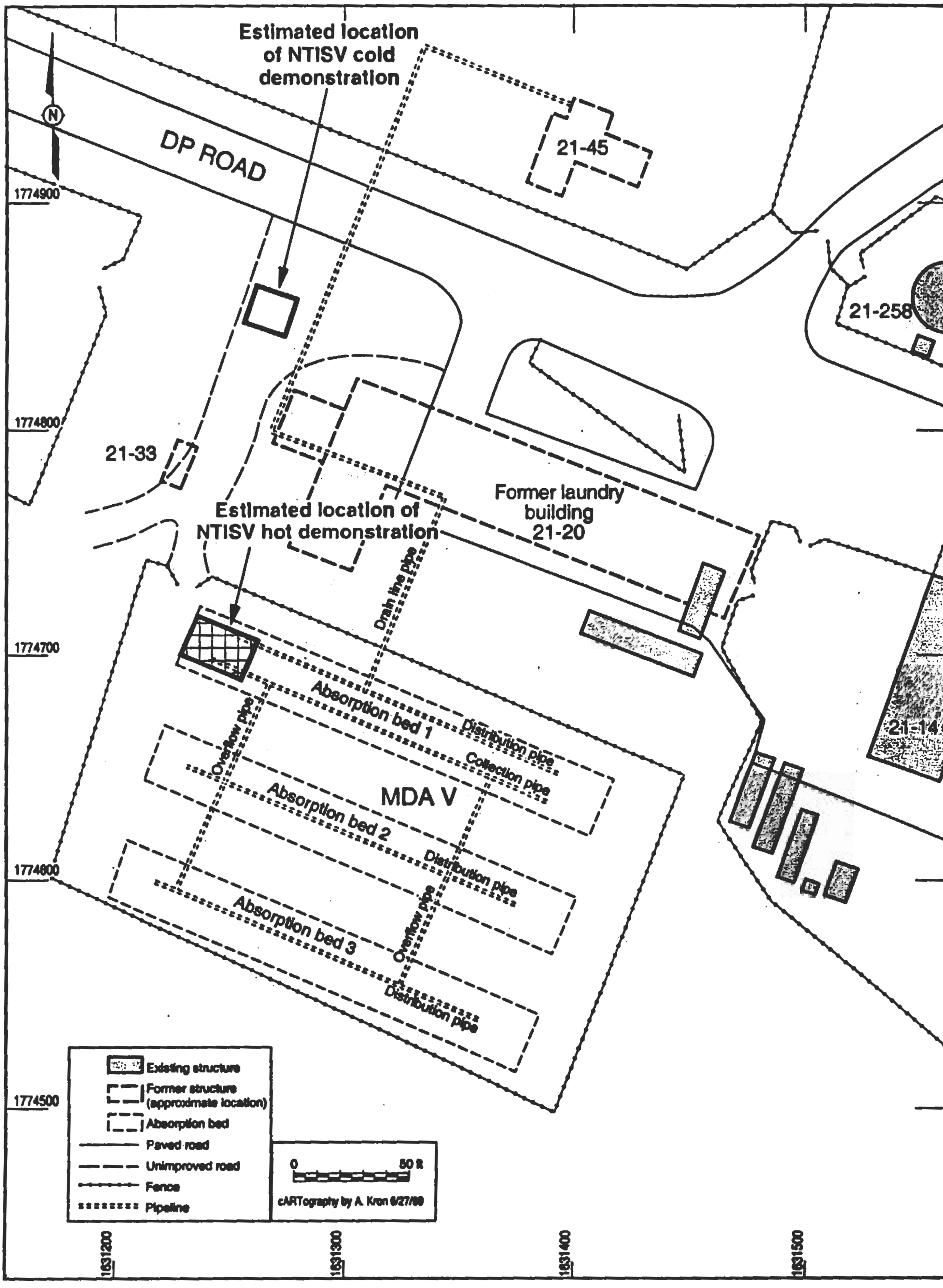


Figure 5.1-1. Location of absorption bed 1 and estimated location of hot demonstration

Waste Streams. The waste streams from the NTISV process will include HEPA filters, water filters, excess starter plane solution, process waste waters, decontamination liquids, personal protective equipment (PPE), disposable sampling supplies, dry decontamination waste and plastic sheeting, and drill cuttings. All waste generated from the off-gas treatment system will be stored and handled in accordance with applicable regulations and Laboratory and ER Project requirements. Waste management is discussed in detail in Section 9.0, Waste Management.

5.2 Predemonstration Samples

Predemonstration samples will be collected from boreholes adjacent to the demonstration melt area and from within absorption bed 1. Analytical results from these samples will assist in evaluating the subsurface fugitive emissions beyond the off-gas hood and the performance of the hot demonstration.

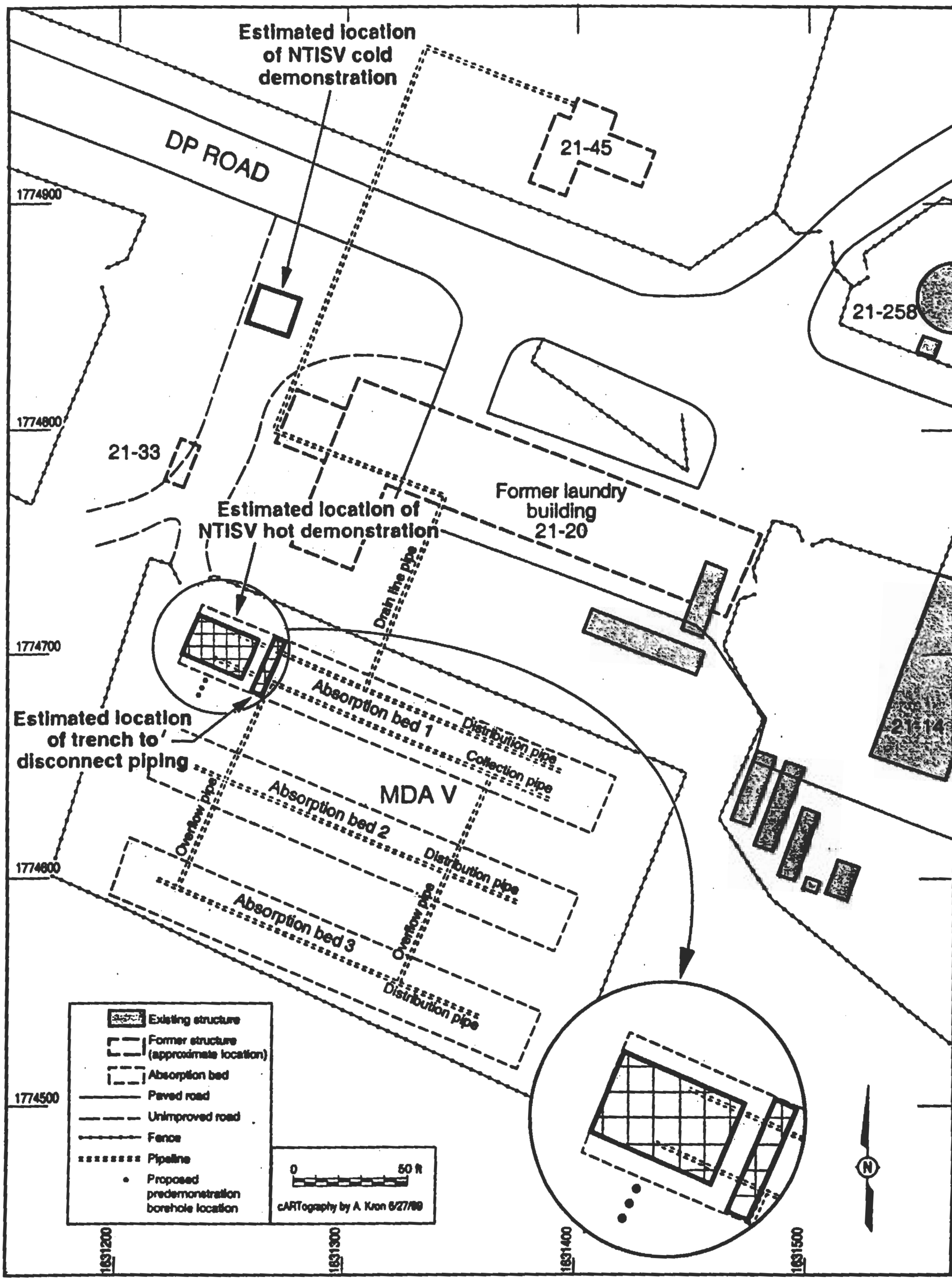
Borehole Samples. Hollow stem augers will be used to drill three boreholes adjacent to the south side of absorption bed 1 and the area of the hot demonstration (Figure 5.2-1). Core will be collected and logged continuously from top to bottom of the borehole. Two samples will be collected with 2.5-ft-long split spoon samplers from each borehole, one at the approximate depth of the bottom of the absorption bed (approximately 7.5 ft below ground surface) and one at the bottom of the borehole at a depth of approximately 25 ft (below the bottom of the melt). Predemonstration data for inorganic chemicals below the absorption bed is provided by the 1994 RFI sampling results from borehole 21-2518 (Figure 2.2-1). The predemonstration samples will provide baseline data for comparison with postdemonstration sample data to determine if contaminants migrated away from the vitrified product and the heat source during the demonstration.

Absorption Bed 1 Samples. Samples will be collected in the upper zone of absorption bed 1 during excavation activities to further identify any radionuclide and inorganic contaminants present within absorption bed 1. The excavation (Figure 5.2-1) will be oriented in a north-south direction across absorption bed 1 and will reach an approximate depth of 7.5 ft. Three samples will be collected from the absorption bed: one from the sand layer, the second from the gravel layer, and the third from the rind off the cobbles in the bottom layer. All appropriate ER standard operating procedures will be followed for all sample collection activities.

Sample Analyses. Analytical parameters for the predemonstration samples are targeted at radionuclides and inorganic chemicals (Table 5.2-1), based on the site operational history provided in Section 2.1 and analytical results from the 1994 drilling activities. Tables 5.2-2 and 5.2-3 provide method summaries of inorganic chemical and radionuclide analyses. These tables include the contract-required detection limits (CRDLs) in accordance with the ER Project analytical services statement of work for contract laboratories (LANL 1995, 49738) and the "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 54609).

For some inorganic chemical analytes (antimony, selenium, and thallium), the CRDLs in the Laboratory's current statement of work are not adequate because they are above Laboratory background values for these analytes. Contract laboratories will be contacted to ensure that detection limits for inorganic chemical analytes are below Laboratory background values.[1]

[1] The new statement of work for contract laboratories does specify new lower CRDLs. Until the new statement of work is adopted, contacting the current laboratories with our detection limit requirements is the only recourse. A detection limit guidance document is currently attached to chain of custody forms to provide the laboratories with current background requirements.



Sources: FIMAD 12/19/95, 104114; LASL 1949, ENG-4C-88C

F5.2-1 / TA-21 IM Plan / 012700 / PTM

Figure 5.2-1. **Proposed predemonstration borehole and absorption bed 1 locations**

Table 5.2-1
Predemonstration Sample Analyses

Analytical Suite	Analytical Technique	Number of Absorption Bed Samples	Number of Borehole Samples
Radionuclide Analyses			
Gamma spectroscopy radionuclides	Gamma spectroscopy	6	6
Uranium isotopes	Chemical separation Alpha spectroscopy	6	6
Plutonium isotopes	Chemical separation Alpha spectroscopy	6	6
Tritium	Liquid scintillation	6	6
Strontium-90	Gas proportional counting	6	6
Inorganic chemical Analyses			
Target analyte list (TAL) metals	ICPES[a,b]	6	6

[a] ICPES = inductively coupled plasma emission spectroscopy.
[b] Mercury analyzed by cold vapor atomic absorption (CVAA).

Table 5.2-2
Method Summary of TAL Metals

Analyte	EPA[a] Sample Preparation Method	Analytical Technique	EDL[b] (mg/kg)
Aluminum	3050B	ICPES[c]	40
Antimony	3050B	ICPES	12
Arsenic	7060A/3050B	ICPES	2
Barium	3050B	ICPES	40
Beryllium	3050B	ICPES	1
Cadmium	3050B	ICPES	1
Calcium	3050B	ICPES	1000
Chromium	3050B	ICPES	2
Cobalt	3050B	ICPES	10
Copper	3050B	ICPES	5
Iron	3050B	ICPES	20
Lead	7421/3050B	ICPES	0.6
Magnesium	3050B	ICPES	1000
Manganese	3050B	ICPES	3
Mercury	7471A	CVAA	0.1
Nickel	3050B	ICPES	8
Potassium	3050B	ICPES	1000
Selenium	7740/3050B	ICPES	1
Silver	3050B	ICPES	2
Sodium	3050B	ICPES	1000
Thallium	7841/3050B	ICPES	2
Vanadium	3050B	ICPES	10
Zinc	3050B	ICPES	4

[a] EPA = Environmental Protection Agency.
[b] EDL = estimated detection limit.
[c] ICPES by EPA Method 6010B.

Table 5.2-3
Method Summary of Radionuclide Analyses

Analyte	Analytical Technique[a]	Soil EQL[b] (pCi/g)
Plutonium-238; -239,240	Alpha spectroscopy	0.1
Uranium-234, -235, -238	Alpha spectroscopy	0.1
Tritium	Liquid scintillation	250
Strontium-90	Proportional counting	2.0
Gamma-emitting isotopes	Gamma spectroscopy	Americium-241, 1.0 Cesium-137, 1.0 Cobalt-60, 0.05

[a] The Laboratory methods for these analytes are contained in Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance (LANL 1993, 31793).

[b] Estimated quantitation limits (EQLs) are not specified for the other 41 gamma-emitting isotopes commonly analyzed; they are determined on a case-specific basis. Based on Laboratory ER guidance the following eight analytes are reliably analyzed by gamma spectroscopy: americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22, and uranium-235.

6.0 MONITORING

Vitrification process monitoring will evaluate the size, shape, and progress of the melt and monitor the air emissions from the off-gas treatment system.

6.1 Activities

Melt Process Monitoring. During the melting process, temperature data from the thermocouples, power level and consumption data, electrode depth, and process observations will be recorded to assist in determining the size and shape of the melt. The thermocouple temperature data will be recorded by an Advantech Adam 5000 data acquisition system at 5-min. intervals throughout the demonstration. Electrical data (primary and secondary voltage, current, and power), off-gas system data (pressures, temperatures, scrub water parameters, and stack gas concentrations), and hood data (temperature and vacuum levels) will be electronically recorded by the DataVue data collection system at 10-sec. intervals. These data will also be recorded manually at 1-hr intervals for the duration of the demonstration. Electrode depth measurements will also be taken and manually recorded at 1-hr intervals. These data parameters will be combined with visual observations to provide a complete assessment of the melt process.

Tomography. Tomography is the process of forming images of the interior of an object from measurements made outside the object along rays passed through the object (Menke 1989, 62929). The methods of tomography that will be utilized include seismic velocity tomography, ground-penetrating radar tomography, and electrical resistance tomography (MSE-TA 1999, 62906). During preparation activities for the hot demonstration six 50-ft-deep boreholes will be drilled outside of the melt area (Figure 6.2-1). Data will be acquired before, during, and after the melt process. The baseline data will be the data collected before the melt and will be compared to the data obtained during and after the melt process. Evaluating data acquired during the melting process will monitor the progression of the melt. After completion of the melt, geophysical data will be collected so the final melt image can be determined. This will include the size, shape, and extent of the vitrified product. Details of tomography activities are described in the VCM plan for consolidated PRS 21-0027(d)-99 (LANL 1999, 63182) and the final MSE-TA report (MSE-TA 1999, 64804).

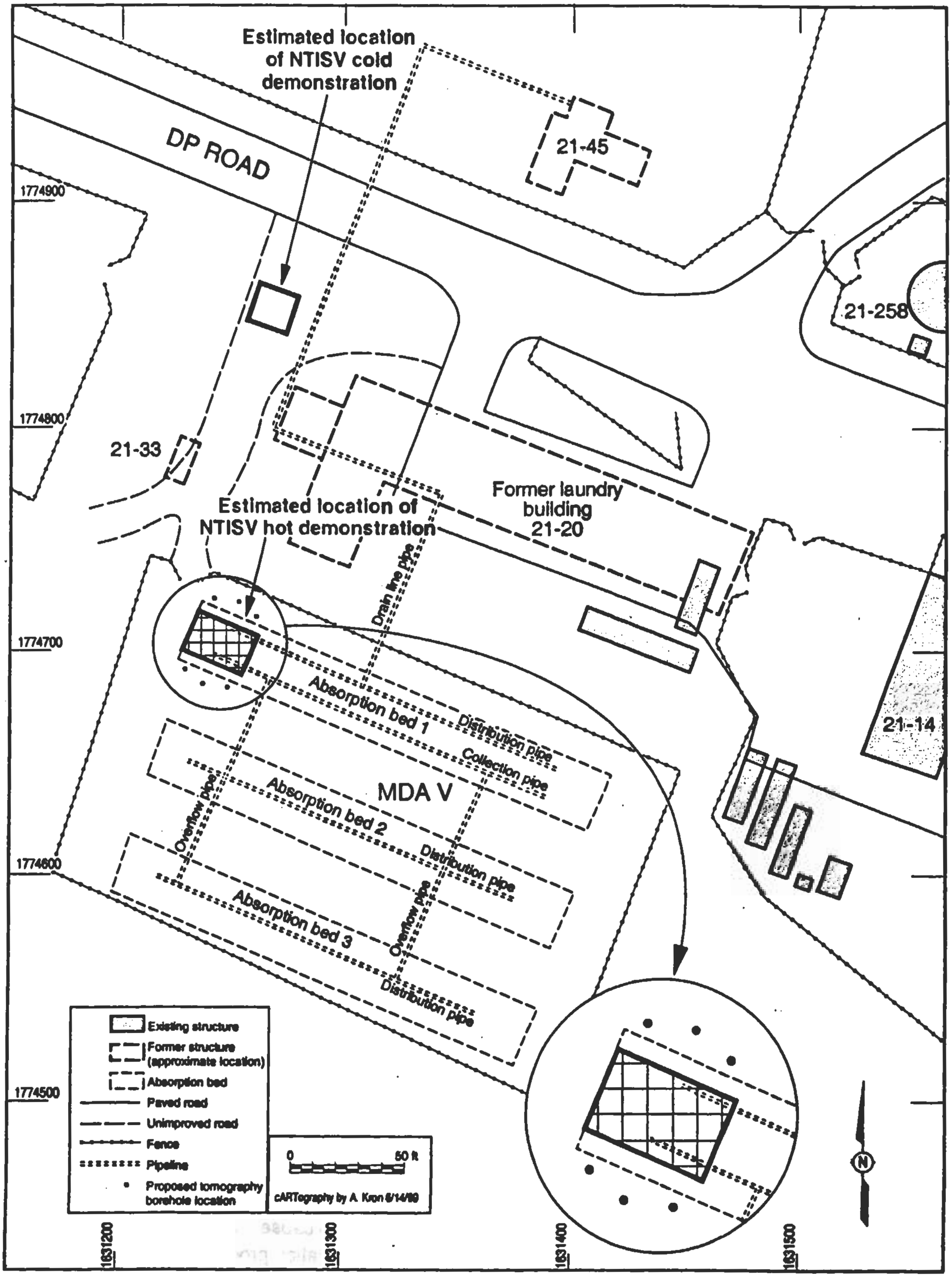


Figure 6.2-1. Proposed tomography borehole locations

Off-Gas Treatment System Monitoring. Air pulled through the hood and processed with the off-gas treatment system will be monitored before release to the environment. The air samples will be collected according to Title 40 CFR, Part 60, Appendix A, "Test Methods"; Title 40 CFR, Parts 1–51, Appendix M, a compendium of methods for the determination of toxic compounds in ambient air; and EPA test methods for evaluating solid waste (SW-846), Volume II, field manual. Which procedures are used will be based on results from the predemonstration sampling. The samples collected will be analyzed using the following methods:

- Methods 1 and 2 will be used to measure the gas velocity and temperature for calculating the volumetric flow rate.
- Method 3A will be used to determine the molecular weight of the outlet gas stream based on measurements of the percent level concentrations of oxygen and carbon dioxide.
- Method 4 will be used along with isokinetic test methods (Methods 5/202, 0010) to measure the moisture content of the stack gas, which is used in calculating the volumetric flow rate and molecular weight on a dry basis.
- Method 5 will be combined with Method 202 to quantify particulate and condensable matter emissions.
- Method 0010 (SW-46) will be used to collect gas samples for semivolatile organic compound (SVOC) analysis, if SVOCs are present and are of interest.
- Method TO-14 will be used and consists of collection of the gas stream in a Summa canister followed by gas chromatograph analysis, if VOCs are present.
- Method 114 will be used for radionuclide analysis.
- Methods 5 and 29 will be used for metals analysis.

The air will be sampled during the demonstration for the following parameters:

- temperature,
- carbon monoxide,
- carbon dioxide,
- oxygen,
- total hydrocarbons,
- metals (cadmium, chromium, copper, lead, mercury, and silver), and
- radionuclides (americium, cesium, plutonium, and uranium).

Shutdown. Power to the melt will be terminated and the system shut down when the power consumption indicates the vitrified mass volume has been achieved and the electrodes reach an approximate depth of 22 ft below grade. The termination depth will be determined by monitoring the electrode insertion depth. The off-gas treatment system will be operated for approximately two additional hours, or as specified by the project manager, to ensure that any contaminants within the off-gas treatment system will be processed.

Traditionally, at hazardous and mixed waste sites, two criteria are used to determine when to terminate off-gas treatment: off-gas temperature and off-gas contaminant concentration. The off-gas treatment system will not be shut down until the off-gas temperature drops below a certain point, typically 100°C. Experience gained during the cold demonstration indicates that this should not be a problem. The depth of the melt, combined with an essentially intact overburden, argues that the off-gas temperature during the hot demonstration will not exceed this criterion. This leaves the off-gas contamination concentration as a criterion of concem. Typically the heat of the melt will continue to cause VOCs to vent for a short period of time after power to the melt is terminated. It is standard operation procedure to monitor the site-specific contaminant concentrations until they attenuate to below established regulatory and/or administrative levels. Only then will the off-gas shutdown procedures be initiated.

7.0 POSTDEMONSTRATION SAMPLING

7.1 Objective

Meeting the objectives of the hot demonstration will be partially determined by the postdemonstration sampling, which consists of

- vitrified product sampling (TCLP testing and PCT);
- verifying the glass-forming process by analyzing the vitrified product by XRD and least-square refinement techniques, optimal polarization microscopy, XRF, SEM, and EMPA;
- soil sampling adjacent to the melt and below the melt for potential contaminant migration away from the heat during the melt process; and
- waste sampling (scrub water, condensate sampling, and HEPA filter sampling).

The objective of the postdemonstration sampling is to verify the effectiveness of the vitrification process in stabilizing the chemicals in the melt.

Vitrified Mass. After adequate cool-down time, approximately 180 days, the vitrified mass will be cored and sampled using a drilling method yet to be determined because of the anticipated elevated temperatures of the vitrified mass. Core will be collected continuously within the vitrified mass. Six samples and one duplicate sample will be collected from the top to the bottom of the vitrified mass at approximately 2-ft intervals or where observation suggests variation in the vitrified mass. The analytical protocol listed in Table 7.1-1 defines the number of samples and the type of analysis. The method summaries for inorganic chemical and radionuclide analyses are the same as in the predemonstration sampling (Tables 5.2-2 and 5.2-3). However, an assessment of the glass-forming process will require other analyses. The following methods have been applied to determine the glass-forming process in NTISV:

- XRD and least-square refinement techniques (Rietveld refinement) to determine the phase constitution and the vitrification progress;
- optical polarization microscopy to determine homogeneity, residuals, and segregation;
- XRF to analyze glass composition and the concentrations of radionuclides and trace metals;
- ICPMS to determine contaminant concentrations within glass;
- SEM to characterize the nature of metal inclusions; and
- EMPA to analyze the compositions of glass and metal inclusions with high spatial resolution.

Several techniques will be employed to assess the mass of the vitrified block.

- Energy usage, electrode depth, and thermocouple data can provide an estimate of mass.
- Analytical results for the vitrified block material will determine the homogeneity and concentrations of contaminants within the vitrified mass.
- Tomography will be utilized to map the size, shape, and extent of the vitrified mass. Tomography data will be compared to baseline results, and a difference tomogram will be generated to evaluate changes in the subsurface resulting from the NTISV melting process. Each tomography method will be used to calculate the estimated dimension of the vitrified product.

Postdemonstration Soil Sampling. Subsurface soil samples will be collected adjacent to the melt and below the melt; these samples will be evaluated for contaminant migration away from the melt. Drilling and sampling methods will consist of hollow stem augers and split spoon samplers. Three boreholes will be drilled and continuously sampled adjacent to and at progressively greater distances downgradient of the absorption bed and approximately 5 ft east of the locations of the predemonstration boreholes. Two samples will be collected for analysis from each borehole, one at the appropriate depth of the bottom of the absorption bed (approximately 7.5 ft below ground surface) and one at the bottom of the borehole at a depth of approximately 25 ft. One borehole will be drilled through the center of the vitrified mass to collect one soil sample directly below the center of the vitrified mass at an approximate depth of 22 ft. Figure 7.1-1 depicts the sample locations, and Table 7.1-1 shows the sample analyses.

Table 7.1-1
Postdemonstration Sample Analyses

Analytical Suite	Analytical Technique	Number of Borehole Samples	Number of Vitrified Core Samples
Radionuclide Analyses			
Uranium isotopes	Chemical separation Alpha spectroscopy	7	7
Plutonium isotopes	Chemical separation Alpha spectroscopy	7	7
Tritium	Liquid scintillation	7	7
Strontium-90	Gas proportional counting	7	7
Gamma-emitting isotope	Gamma spectroscopy	7	7
Gamma spectroscopy radionuclides	Gamma spectroscopy	7	7
Inorganic chemical Analyses			
TAL metals	ICPES*	7	7
Metals	TCLP	7	7
Uranium	ICPMS	7	7
Product Volume Determination (x and y analyses)			
Product volume	XRF	7	7
Toxic characteristic leachate testing			
TCLP analytes	TCLP methods PCT	7	7

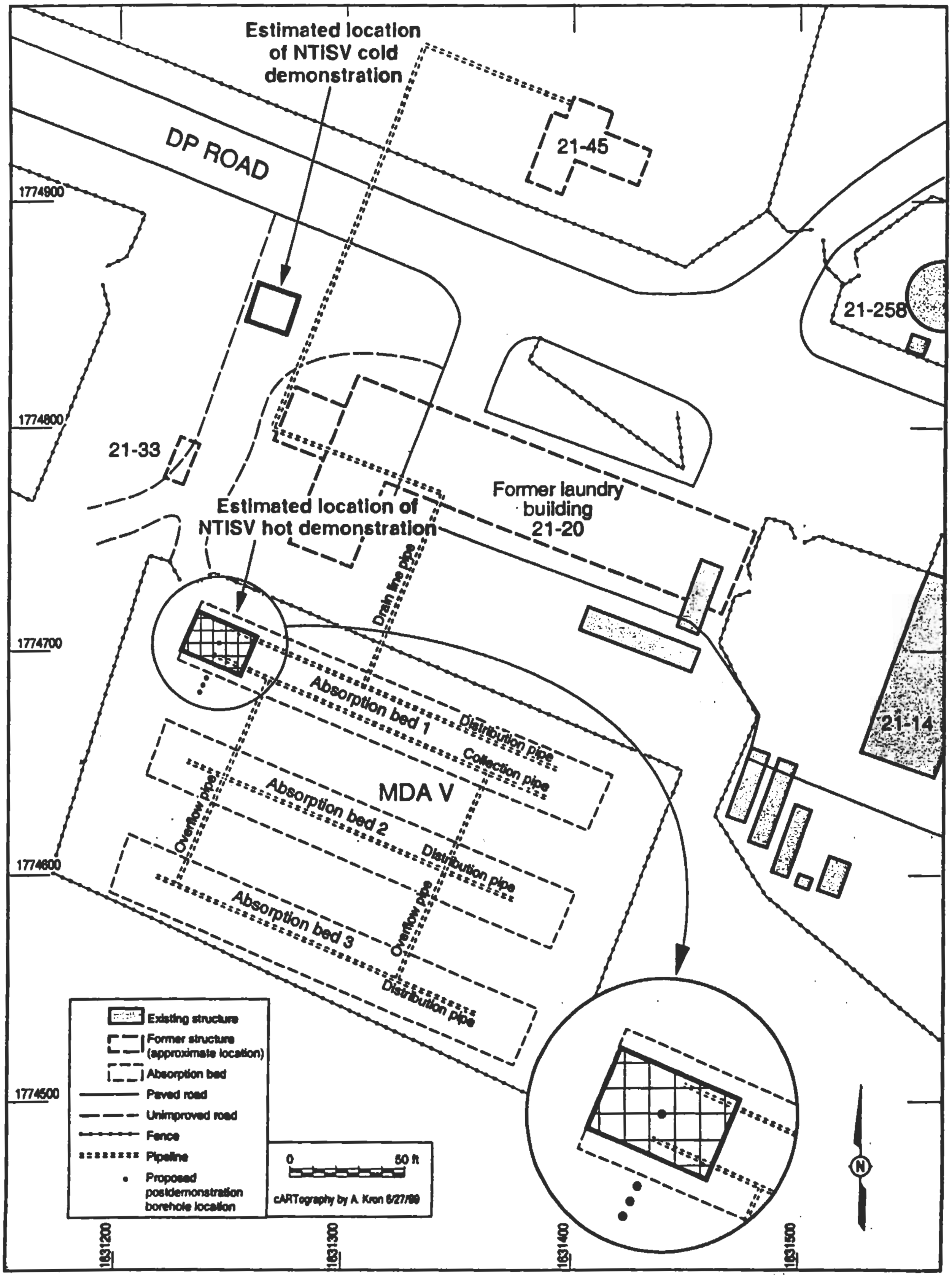
*Mercury analyzed by cold vapor atomic absorption.

7.2 Site Restoration

Following the interim measure activities, the site will be restored to its predemonstration condition. Clean soil and gravel similar to the existing surface soils will be placed over the vitrified mass. The surface will be graded, the area will be seeded with vegetation that is similar to the existing plant life, and the fencing will be repaired to preexisting conditions. Seeding will take place after the melt cools enough to allow the surface soil to germinate seeds.

8.0 MAINTENANCE AND INSPECTION

Periodic inspections and maintenance may be performed on the contoured and revegetated mesa top to ensure that erosion and storm water run-on does not occur. Presently, there are no requirements for inspection and maintenance to be performed after completion of the IM; however, if regulatory requirements change, action will be taken to comply.



Sources: FIMAD 12/19/95, 104114; LASL 1949, ENG-4C-88C

F7.1-1 / TA-21 IM Plan / 012700 / PTM

Figure 7.1-1. Proposed postdemonstration borehole locations

9.0 WASTE MANAGEMENT

All wastes will be characterized, packaged, and disposed of in compliance with all federal, DOE, and state regulations. The categories of waste anticipated from this interim measure are solid and liquid low-level waste (LLW) and liquid mixed waste. Solid LLW includes drill cuttings, HEPA filters, water filters (drained and absorbent added if necessary), and other contact wastes including PPE, disposable sampling equipment, plastic, and packaging materials. Solid LLW will be characterized and packaged for disposal at TA-54, MDA G. Compactible LLW will be placed into appropriate containers for shipment to the TA-54 compactor. Liquid LLW includes process and decontamination waste waters and electrolytic starter solutions. Liquids will be analyzed to meet the waste acceptance criteria for the TA-50 Radioactive Liquid Waste Treatment Facility; this will include analysis for VOCs and SVOCs from the off-gas treatment system. If TA-50 cannot accept the liquid waste, then acceptance criteria for TA-54 will be met. Liquid mixed waste includes process waste water from the condensate tank after the first set of HEPA filters. Liquids will be packaged in either 55 gal. drums or a bulk tank. Secondary containment will be provided for all stored liquid waste, as appropriate. Potential wastes generated during the IM activities are summarized in Table 9.0-1.

Table 9.0-1
Anticipated Waste Type and Volume for IM

Item	Waste Type*	Anticipated Volume
HEPA filters	Solid, nonhazardous, low-level radioactive	~12 filters
Water filters	Solid, nonhazardous, low-level radioactive, metals	<1 yd^3
Air emission scrubber water	Liquid, nonhazardous, low-level radioactive, metals	<4000 gal.
Starter plane material	Liquid, nonhazardous, low-level radioactive	<150 gal.
Air emission condensate water	Liquid, mixed RCRA, low-level radionuclide	<150 gal.
PPE, plastic, material packaging	Solid, nonhazardous, low-level radioactive	<5 m^3
Drill cuttings	Solid, nonhazardous, low-level radioactive	~20 m^3

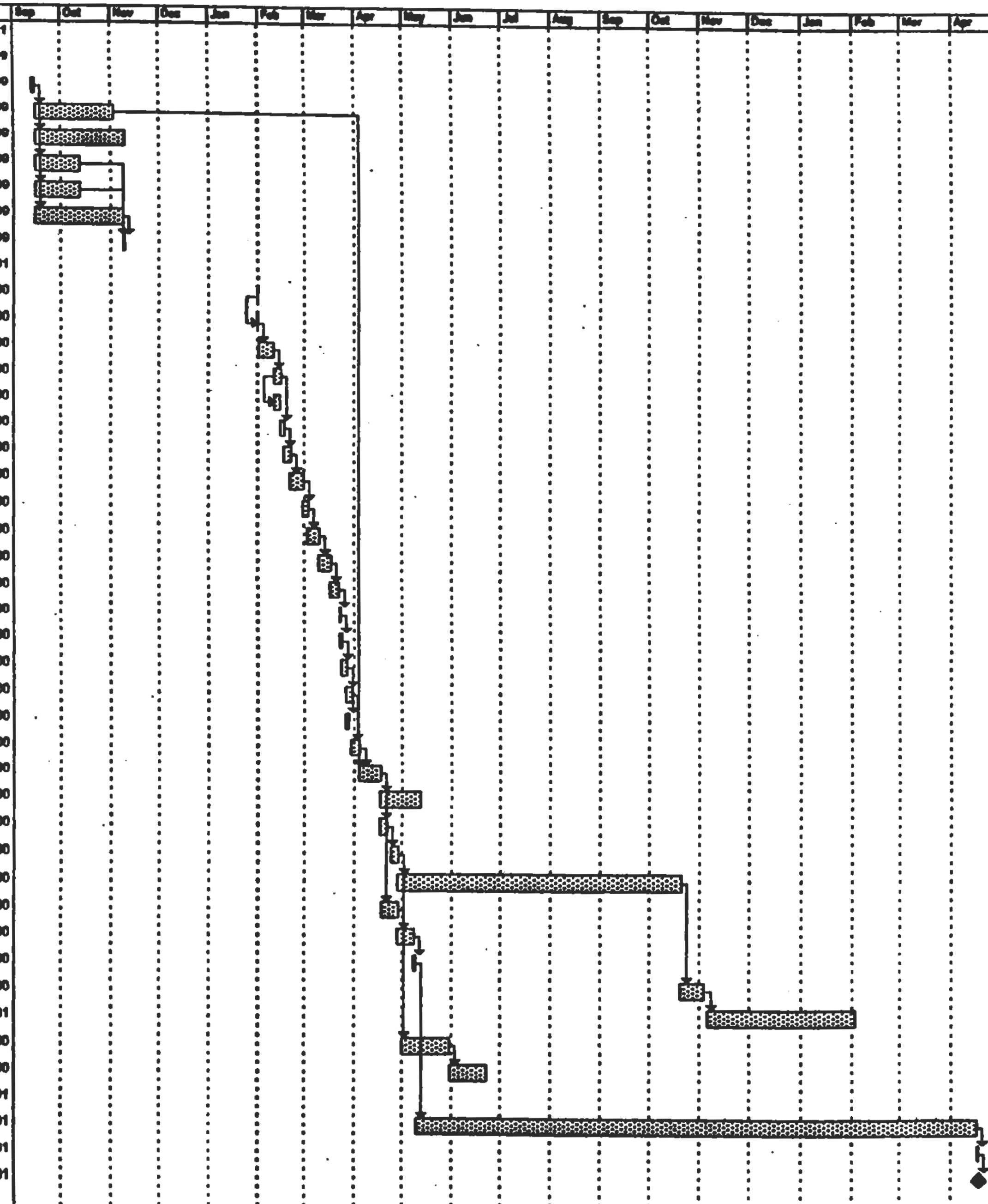
* All waste associated with the off-gas treatment system has the potential to be LLW because components are radioactively contaminated. The components were received from Oak Ridge National Laboratory.

10.0 SCHEDULE

The following schedule provides a timeline for the NTISV field activities. Included are the interim measure field operations at PRS 21-018(a)-99 that are scheduled to begin in January 2000. The duration of the field operations is anticipated to be approximately four months.

NTISV Hot Demonstration Schedule

ID	Task Name	Start	Finish
1	LANL NTISV Hot Demonstration	Mon 9/13/99	Tue 4/17/01
2	Planning	Mon 9/13/99	Tue 11/9/99
3	Hot Demo Kickoff Meeting With DOE	Mon 9/13/99	Tue 9/14/99
4	Prepare IM Plan for NTISV	Wed 9/15/99	Tue 11/2/99
5	Modifications to Equipment and Procurements	Wed 9/15/99	Tue 11/9/99
6	Generate RWP for Hot Demo	Wed 9/15/99	Tue 10/12/99
7	Generate THA for Hot Demo	Wed 9/15/99	Tue 10/12/99
8	Readiness Review Prep	Wed 9/15/99	Mon 11/8/99
9	Complete Readiness Review	Tue 11/9/99	Tue 11/9/99
10	Field Activities	Mon 1/31/00	Fri 2/2/01
11	Hot Demo Kickoff Meeting and Mobilization	Mon 1/31/00	Mon 1/31/00
12	Clear Vegetation from Demo Area	Mon 1/31/00	Mon 1/31/00
13	Isolate Piping in Bed 1 and Collect Samples	Tue 2/1/00	Thu 2/10/00
14	Pre-Demo Char. Sampling of Surrounding Soil	Fri 2/11/00	Tue 2/15/00
15	Remove Fence from MDA V NW Corner	Fri 2/11/00	Mon 2/14/00
16	Fill and Grade Hot Demo Area	Tue 2/15/00	Thu 2/17/00
17	Dynamic Disruption of Soil	Thu 2/17/00	Mon 2/21/00
18	Electrode Installation	Mon 2/21/00	Tue 2/29/00
19	Inject Starter Planes	Tue 2/29/00	Fri 3/3/00
20	Tomography Well Installation	Fri 3/3/00	Fri 3/10/00
21	Allow Tomography Wells to Cure	Fri 3/10/00	Fri 3/17/00
22	Pre-Demo Tomography Testing	Fri 3/17/00	Wed 3/22/00
23	Install Gravel Overburden Layer	Thu 3/23/00	Thu 3/23/00
24	Remove Power Line to Air Monitor	Thu 3/23/00	Fri 3/24/00
25	Move Hood Over Cell	Fri 3/24/00	Mon 3/27/00
26	Connect Hood to ISV System	Mon 3/27/00	Thu 3/30/00
27	Reconnect Power to Air Monitor Station	Mon 3/27/00	Tue 3/28/00
28	Perform System Check-out	Thu 3/30/00	Tue 4/4/00
29	Perform Hot Demonstration Test	Tue 4/4/00	Mon 4/17/00
30	Perform Operational Data Evaluation	Mon 4/17/00	Fri 5/12/00
31	Perform Post-Demo Tomography	Mon 4/17/00	Fri 4/21/00
32	Post-Demo Soil Sampling	Mon 4/24/00	Fri 4/28/00
33	Allow Vitrified Product to Cool	Fri 4/28/00	Fri 10/20/00
34	Decontaminate NTISV Equipment	Tue 4/18/00	Fri 4/28/00
35	Demobilize Personnel and Equip from Site	Fri 4/28/00	Mon 5/8/00
36	Restore NTISV Demo Site	Mon 5/8/00	Tue 5/9/00
37	Core to Obtain Samples of Glass	Fri 10/20/00	Sat 11/4/00
38	Assessment of Glass Samples	Mon 11/6/00	Fri 2/2/01
39	Baseline Validation and Data Editing	Mon 5/1/00	Tue 5/30/00
40	Focused Validation and Evaluate Sampling Results	Wed 5/31/00	Thu 6/22/00
41	Reporting	Wed 8/10/00	Tue 4/17/01
42	Prepare Draft Report	Wed 8/10/00	Mon 4/16/01
43	Final Report Submittal to NMED	Tue 4/17/01	Tue 4/17/01
44	Project Complete	Tue 4/17/01	Tue 4/17/01
45			



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11.0 REFERENCES

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the ER record identification (ER ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and, where applicable, with the ER Project reference library titles "Reference Set for Material Disposal Areas, Technical Area 21."

Copies of the reference library are maintained at the NMED Hazardous and Radioactive Materials Bureau; the DOE Los Alamos Area Office; United States EPA, Region VI; and the ER Project Material Disposal Areas Focus Area. This library is a living collection of documents that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included.

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Appendix A

List of Acronyms

APPENDIX A LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
CRDL	contract-required detection limit
CVAA	cold vapor atomic absorption
DOE	US Department of Energy
EDL	estimated detection limit
EMPA	electron-beam microprobe analysis
EPA	Environmental Protection Agency
EQL	estimated quantitation limit
ER	environmental restoration
FIMAD	Facility for Information Management, Analysis, and Display
HEPA	high-efficiency particulate air (filter)
IA	interim action
ICPAES	inductively coupled plasma atomic emission spectroscopy
ICPES	inductively coupled plasma emission spectroscopy
ICPMS	inductively coupled plasma mass spectroscopy
IM	interim measure
Laboratory	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory
LLW	low-level waste
MDA	material disposal area
NMED	New Mexico Environment Department (New Mexico Environmental Improvement Division before 1991)
NTISV	nontraditional in situ vitrification
PCT	product consistency testing
PPE	personal protective equipment
ppm	parts per million
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
SAL	screening action level
SEM	scanning electron microscopy
SMDP	strategic management decision point
SOP	standard operating procedure
SVOC	semivolatile organic compound
T&E	threatened and endangered
TA	technical area
TAL	target analyte list

TCLP	toxic characteristic leachate procedure
UTL	upper tolerance limit
VCM	voluntary corrective measure
VOC	volatile organic compound
XRD	x-ray diffusion
XRF	x-ray fluorescence

Appendix B

Ecological Scoping Checklist

APPENDIX B ECOLOGICAL SCOPING CHECKLIST

B-1.0 PART A, SCOPING MEETING DOCUMENTATION

Site Identification	Potential Release Site 21-018(a), Material Disposal Area V
Form of Site Releases (solid, liquid, vapor) Describe all relevant known or suspected *mechanisms* of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential *areas* of release. Reference locations on a map, as appropriate.	The release at the site was liquid waste disposed of in absorption beds. The contamination was primarily confined to the subsurface soil. Indications are that the absorption beds may have overflowed, especially at the southeast corner, and contamination may have been introduced onto the slope leading into Los Alamos Canyon.
List of Primary Impacted Media Indicate all that apply.	Surface soil – Surface soils on the slope leading into Los Alamos Canyon may have been contaminated as a consequence of the overflow from the absorption beds. Surface water/sediment – Not applicable Subsurface – The absorption beds are fill material consisting of cobble, gravel, and crushed tuff. The beds were excavated down to the tuff, approximately 6 ft or more in depth. No other media were affected. Groundwater – Not applicable Other, explain – Not applicable
Facility for Information Management, Analysis, and Display (FIMAD) Vegetation Class Based on Arcview Vegetation Coverage Indicate all that apply.	Water – Not applicable Bare ground/unvegetated – The slope leading into Los Alamos canyon is a combination of bare ground and scattered vegetation. Spruce/fir/aspen/mixed conifer – Not applicable Ponderosa pine – Not applicable Piñon juniper/juniper savannah – Not applicable Grassland/shrubland – Not applicable Developed – The site is covered with grass and chamisa and is surrounded by a chainlink fence.
Is threatened and endangered (T&E) species habitat present? If applicable, list species known or suspected that use the site for breeding or foraging.	The site is on the border of the core habitat for the Mexican spotted owl. This site is within an area that the owl may be assumed to forage with a moderate to low frequency. This site is within an area where the potential for foraging for the peregrine falcon is low.
Provide a list, of neighboring/ contiguous/ upgradient sites; include a brief summary of chemicals of potential concern and the form of releases for relevant sites, and reference a map, as appropriate. Use this information to evaluate the need to aggregate sites for screening.	The in situ vitrification cold demonstration site [Potential Release Site (PRS) 21-027(d)-99] is located immediately north of Material Disposal Area (MDA) V. MDA B (PRS 21-015) is located immediately to the northwest of MDA V. PRSs 21-013(b,g) are also south of MDA V and drain into the canyon approximately 200 ft to the south of MDA V. The releases from the MDAs could be organic chemicals, inorganic chemicals, and radionuclides in the subsurface. Potential releases from 21-013(b,g) would be included in surface runoff. PRS 21-023(c) is adjacent to and east of the outfall from 21-027(d)-99. This PRS was a septic tank outfall.
Surface Water Erosion Potential Information Summarize information from the standard operating procedure (SOP) 2.01, including the runoff subscore (maximum of 46), terminal point of surface water transport, slope, and surface water run-on sources.	Site Setting score: 3.6 Surface water run-off score: 14.5 (includes a score of 9.5 for the terminal point of surface water transport [bench in Los Alamos Canyon]) Surface water run-on score: 0 Total score: 18.1
Other Scoping Meeting Notes	None

B-2.0 PART B, SITE VISIT DOCUMENTATION

Site Identification	**PRS 21-018(a), MDA V**
Date of Site Visit	4/9/99
Site Visit Conducted by	Richard Mirenda and Ray Wright

Receptor Information

Estimate Cover	Relative vegetative cover (high, medium, low, none) = high at the MDA; the area is covered with grass and chamisa. Vegetative cover is medium on the slope; it is a combination of bare ground and scattered shrubs, grass, and trees. Relative wetland cover (high, medium, low, none) = none Relative structures/asphalt, etc. cover (high, medium, low, none) = none
Field Notes on the FIMAD Vegetation Class to Assist in Ground-Truthing the Arcview Information	Site visit confirmed that the only vegetation present at the site is grasses and chamisa. The slope is also confirmed as bare ground and scattered vegetation.
Field Notes on T&E Habitat (if applicable) Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	The site presents some available forage but no nesting habitat for T&E species.
Are ecological receptors present at the site? (yes/no/uncertain) Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.	Yes. Site is open to receptors. Area may be used for foraging but probably not for nesting. No evidence of burrowing animals is apparent at the MDA. Burrowing animals may be present on the slope or the downgradient bench above the canyon. No aquatic habitat is present on or near the site.

Contaminant Transport Information

Surface Water Transport Field notes should summarize the erosion potential, including a discussion of the terminal point of surface water transport, if applicable.	No evidence of erosion was observed at the MDA. However, there is evidence of erosion on the canyon slope below the site. It is not clear what, if any, the MDA contributes to this. The area is relatively flat (approximately 1–2% slope) and covered with vegetation. An asphalt drainage channel is located around the perimeter of MDA V to direct surface runoff away from the PRS. Surface water runoff eventually would go into the canyon located approximately 100 ft south of the site. It is suspected that one or more of the absorption beds may have overflowed resulting in contamination being introduced 2.5 to 50 ft downgradient from the MDA.
Are there any off-site transport pathways (surface water, air, or groundwater)? (yes/no/uncertain)	Yes. Some contamination may have been transported into the canyon by surface water runoff from the overflow of the absorption beds. Groundwater is approximately 1200 ft below the site and is unlikely to be affected because there is no hydraulic head to promote downward movement. Deep sample results do not indicate contamination at 75 ft.
Is an interim action (IA) needed to limit off-site transport? (yes/no/uncertain) Provide explanation/ recommendation to project lead for IA strategic management decision point (SMDP).	This site is the subject of an interim measure. The MDA is covered with grass, and no ecological impacts from site use were observed. The slope into the canyon has blocks of concrete and asphalt pieces scattered throughout, which may act to control runoff to some degree.

Ecological Effects Information

Physical Disturbance Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.	The site has not been physically disturbed for some time. No evidence of erosion was observed in the area of the MDA. Erosion and surface runoff were evident on the slope into the canyon.
Are there obvious ecological effects? (yes/no/uncertain) Provide an explanation and apparent cause (e.g., contamination, physical disturbance, other).	The site is the subject of an interim measure. The MDA is covered with grass and no ecological impacts from site use were observed. The slope into the canyon has blocks of concrete and asphalt pieces scattered throughout, which do not affect the ecology.
IA needed to limit apparent ecological effects? (yes/no/uncertain) Provide explanation and recommendations to mitigate apparent exposure pathways to project lead for IA SMDP.	No. The release is subsurface and is unlikely to move. Further investigations will be conducted to better determine the extent of radiological contamination from absorption bed overflow.

No Exposure/Transport Pathways

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to off site receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological no further action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport. The primary release was from the disposal of liquid waste into the absorption beds. This material was buried at a depth of 5–6 ft and does not have any potential for migrating to groundwater. However, the absorption beds may have overflowed resulting in contamination being introduced into the surface drainage of Los Alamos Canyon. Therefore, the site cannot be proposed for an ecological no further action at this time. Further investigation will determine if contamination is present because of overflow conditions that may have occurred.

Adequacy of Site Characterization

Do existing or proposed data provide information on the nature, rate, and extent of contamination? (yes/no/uncertain) Provide explanation. (Consider if the maximum value was captured by existing sample data.)	No. Further investigations will be conducted to better determine the extent of radiological contamination from absorption bed overflow. The vertical extent of the contamination has been defined by previous sampling.
Do existing or proposed data for the site address potential transport pathways of site contamination? (yes/no/uncertain) Provide explanation. (Consider if other sites should be aggregated to characterize potential ecological risk.)	Yes. Existing data indicate that there may be contamination introduced into the surface drainage of Los Alamos Canyon. Further investigations will be conducted to better determine the extent of radiological contamination from absorption bed overflow.

Additional Field Notes

Provide additional field notes on the site setting and potential ecological receptors.

B-3.0 PART C, ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Question A

Could soil contaminants reach receptors by way of vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm/me/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No volatile chemicals were detected.

Question B

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: Potential contamination on the slope and drainage is exposed and would be subject to movement by way of the wind. There does not appear to be evidence of burrowing animals in the vicinity of MDA V.

Question C

Can contaminated soil be transported to aquatic ecological communities (use SOP 2.01 run-off score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 runoff score* for each PRS included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* Note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: Although the MDA is surrounded by a asphalt run-on control channel, surface runoff from the mesa top may be significant and may transport materials into Los Alamos Canyon.

Question D

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

Known or suspected presence of contaminants in groundwater.

- **The potential for contaminants to migrate by way of groundwater and discharge into habitats and/or surface waters**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No potential for material to migrate to groundwater based on sample results.

Question E

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **Suspected ability of contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate by way of groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Groundwater is approximately 1200 ft below the site and is unlikely to be affected because there is no hydraulic head to promote downward movement.

Question F

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: The slope of the canyon is subject to erosion. Mass wasting events may occur resulting in deposition and increased erosion of material in canyon especially from absorption bed 3.

Question G

Could airborne contaminants interact with receptors through respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of inhalation of vapors for burrowing animals.**
- **Foliar uptake of organic vapors is typically not a significant exposure pathway.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No volatiles detected.

Question H

Could airborne contaminants interact with plants through deposition of particulates or with animals through inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure by way of inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 2

Terrestrial Animals: 2

Provide explanation: Contaminants from the absorption bed overflow can be distributed by particulates by way of the wind to plant and animal receptors.

Question I

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 2

Provide explanation: Contaminants are present primarily in the subsurface soil in the area of the MDA. The subsurface contamination is within 3 ft of the surface at some locations, which may allow some uptake by way of the roots of the overlying grass cover. However, the overflow of the absorption beds may have introduced contaminants to the surface soil on the canyon slope, which may also be deposited on plant surfaces.

<u>Question J</u>

Could contaminants interact with receptors through food web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 3

Provide explanation: Some contaminants are known bioaccumulators.

<u>Question K</u>

Could contaminants interact with receptors by way of incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil, or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 3

Provide explanation: Although most contaminants are present in the subsurface soil, the overflow from the absorption beds to the canyon slopes has made contaminants available through the incidental ingestion of soil.

<u>Question L</u>

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure by way of dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Animals: 1

Provide explanation: Contaminants are not lipophilic.

Question M

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 1

Terrestrial Animals: 1

Provide explanation: Radionuclides detected at MDA V are primarily alpha emitters, but some gamma emitters have been detected.

Question N

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question O

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question P

Could contaminants interact with receptors by way of ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question Q

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 =major pathway):

Terrestrial Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question R

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS, on the canyon slope below the PRS, or on the bench below the PRS.

Question S

Could contaminants bioconcentrate in free-floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question T

Could contaminants bioconcentrate in sedimentary or water column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Aquatic Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question U

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Aquatic Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.

Question V

Could contaminants interact with aquatic plants or animals through external irradiation?

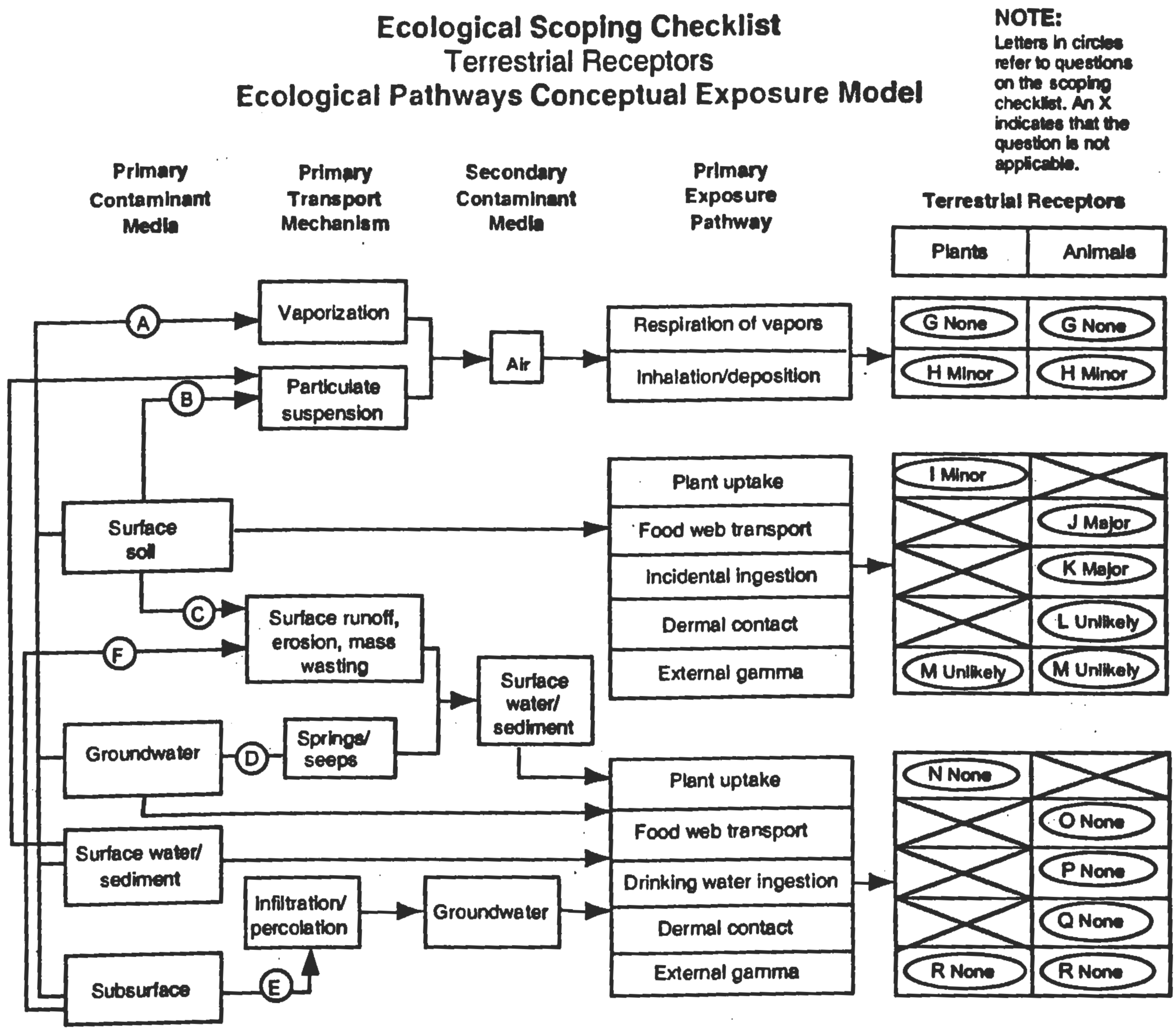
- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation, thus external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

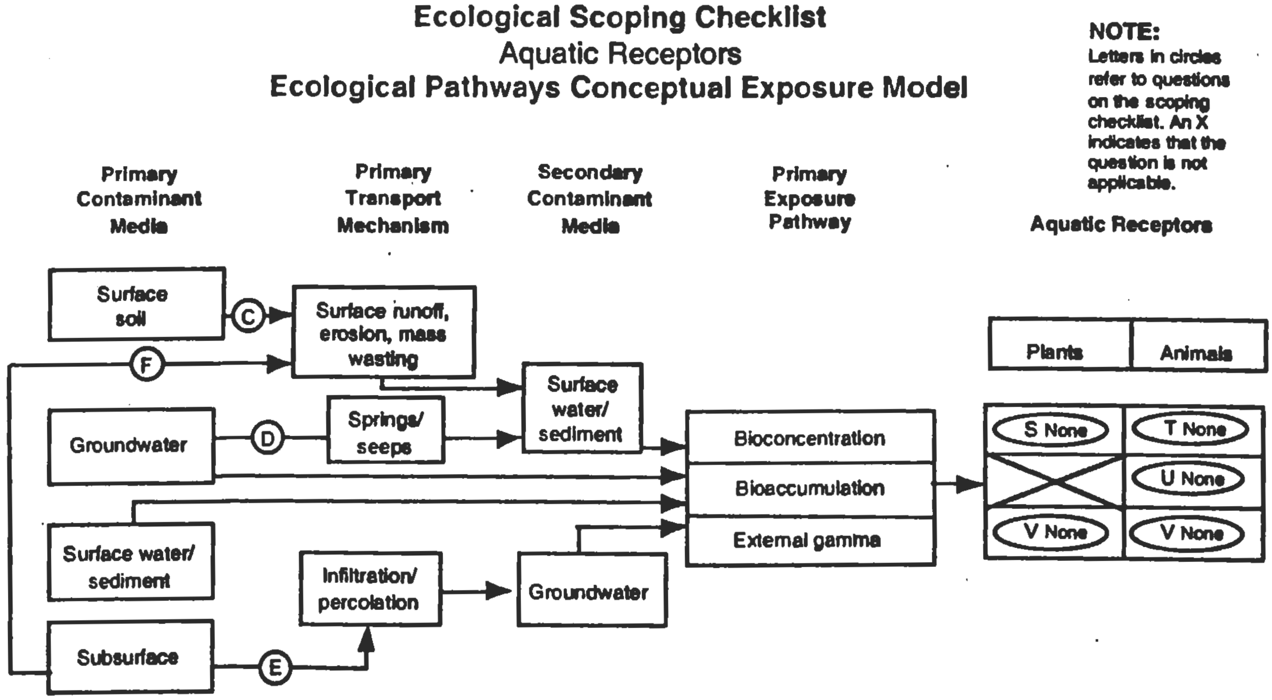
Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: No aquatic systems are present in the vicinity of the PRS and canyon slope.


Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model
NOTE: Letters in circles refer to questions on the scoping checklist. An X indicates that the question is not applicable.
Primary Contaminant Media
Primary Transport Mechanism
Secondary Contaminant Media
Primary Exposure Pathway
Terrestrial Receptors
Plants
Animals
A
Vaporization
B
Particulate suspension
Air
Respiration of vapors
Inhalation/deposition
G None
G None
H Minor
H Minor
Surface soil
C
Surface runoff, erosion, mass wasting
F
Plant uptake
Food web transport
Incidental ingestion
Dermal contact
External gamma
I Minor
J Major
K Major
L Unlikely
M Unlikely
M Unlikely
Surface water/ sediment
Groundwater
D
Springs/ seeps
Surface water/ sediment
Infiltration/ percolation
Groundwater
Subsurface
E
Plant uptake
Food web transport
Drinking water ingestion
Dermal contact
External gamma
N None
O None
P None
Q None
R None
R None

Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model



Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed): Richard Mirenda, Ph.D.

Name (signature): Richard Mirenda

Organization: MK/PMC

Phone number: 662-1329

Date completed: 5/13/99

Verification by a member of ER Project Ecological Risk Task Team (provide name, organization and phone number):

Name (printed): Lars Soholt

Name (signature): Lars F. Soholt

Organization: E/ER

Phone number: 7-2256

Appendix C

Surface Water Assessment

Los Alamos National Laboratory

Environment, Safety & Health Division
ESH-18 Water Quality & Hydrology Group

Surface Water Assessment
Erosion Matrix for PRS 21-018(a)

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential: Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section.			5.0
		If yes, score 5 and proceed with section.			
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	9.5
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	0.0
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
***Select either structures or natural drainages.**					
MAX. POSSIBLE EROSION MATRIX SCORE:	100			Total Score	18.1**

** Indicates BMPs in place. Erosion potential without BMPs may be greater.

Report Printed 6/25/99 11:59:26 AM.

Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number: 21-018(a) 1b) Structure Number: 1c) FMU Number: 80

2. Date/Time (M/D/Y H:M am/pm): 5/18/99

SITE SETTING (check all that apply)

3. (●) On mesa top (a). ( ) In the canyon floor, but not in an established channel (c).
( ) Within a bench of a canyon (b). ( ) Within established channel in the canyon floor (d).

Explanation: According to the approved TA-21 RFI work plan, 21-018(a) is material disposal area V (MDA V) which contained three absorption beds. The absorption beds were used for liquid waste disposal from a laundry operation at Building TA-21-20 (PRS 21-018(b)) and were in used from October 1945 to 1961.

4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees, structures, asphalt, etc.)

(illustration) (a) (b) (c)

Estimated % of ground/canopy cover: ( ) 0% to 25% ( ) 25% to 75 (●) 75% to 100

Explanation: Site fenced off with heavy vegetation throughout.

5. Steepest slope at the area impacted:

(a) (b) (c)

(●) Less than 10% ( ) 10% to 30% ( ) 30% and greater

Explanation: Fenced area is generally flat and back from the mesa +/- 50 feet.

RUNOFF FACTORS

Y / N

☑ ☐ 6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:

☐ ☑ 6a) Is runoff channelized? If yes, describe ( ) Man-made channel. ( ) Natural channel.

Explanation: Sheet flow runoff, doesn't appear to reach canyon rim very often.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

( ) Drainage or wetland (name) Los Alamos Canyon

(•) Within bench of canyon setting (name) Bench

( ) Other (i.e., retention pond, meadow, mesa top)

Explanation: Periodic discharges over edge of mesa, but at relatively low volumes.

Y / N

☐ ☑ 6c) Has runoff caused visible erosion at the site? If yes, explain below ( ) Sheet ( ) Rill ( ) Gully

Explanation: None observed. See 21-013(b&g) for downslope PRS assessments.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☐ ☑ 7. Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation: None

☐ ☑ 8. Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation: None

☐ ☑ 9. Are natural drainage patterns directing stormwater onto site?

Explanation: None

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Veenis, Steve

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	○	◉	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

Asphalt run-on diversion channel on northside of site.

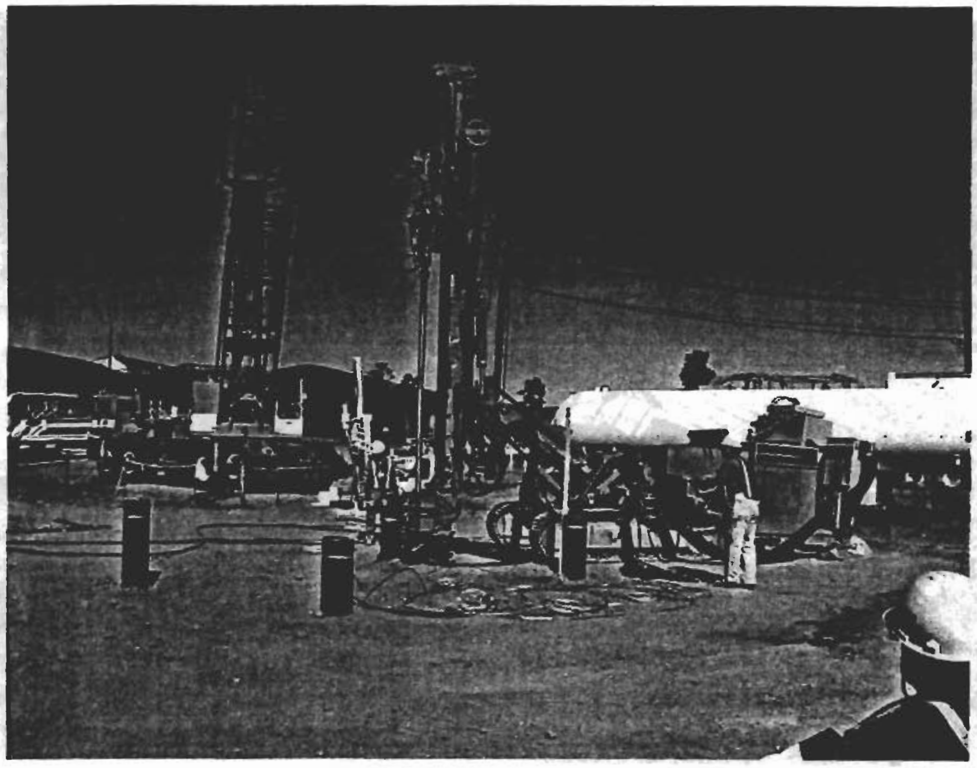
Y	N	
◉	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
◉	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

ISV Project ongoing on the northside of the MDA. If future ISV project includes the MDA, then the need for BMPs should be re-assessed.

Appendix G

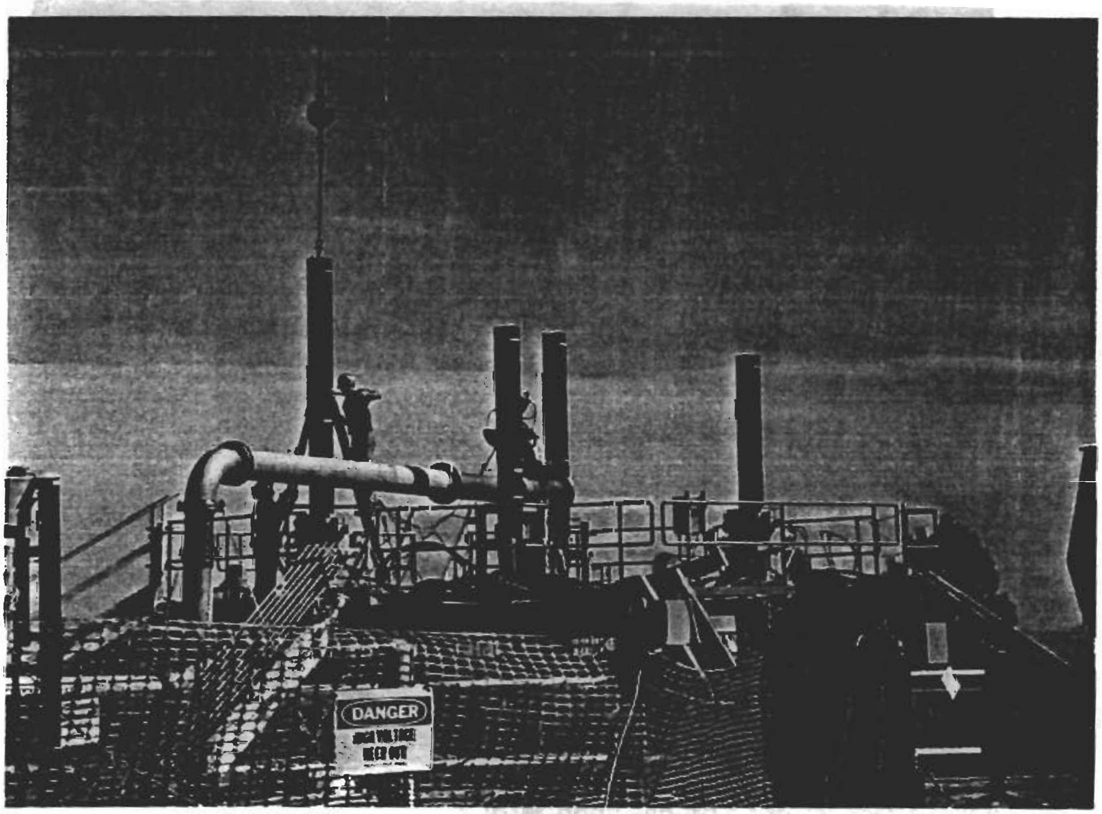
Photographs



Photograph 1. Installation of electrodes at the hot demonstration site, MDA V

Photograph 2. Crane lowering off-gas hood, MDA V

Photograph 3. Aerial view of hot test demonstration site, MDA V

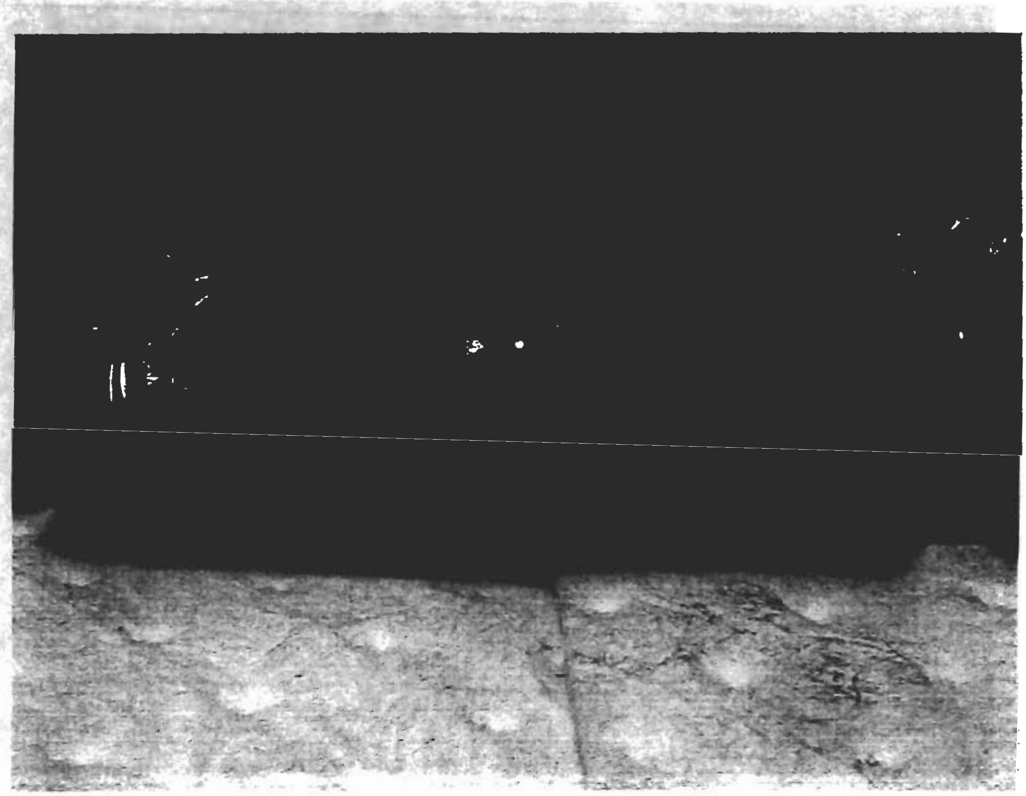


Photograph 4. Lowering electrodes as demonstration progresses

Photograph 5. **View of MDA V looking south, following the hot demonstration, MDA V**

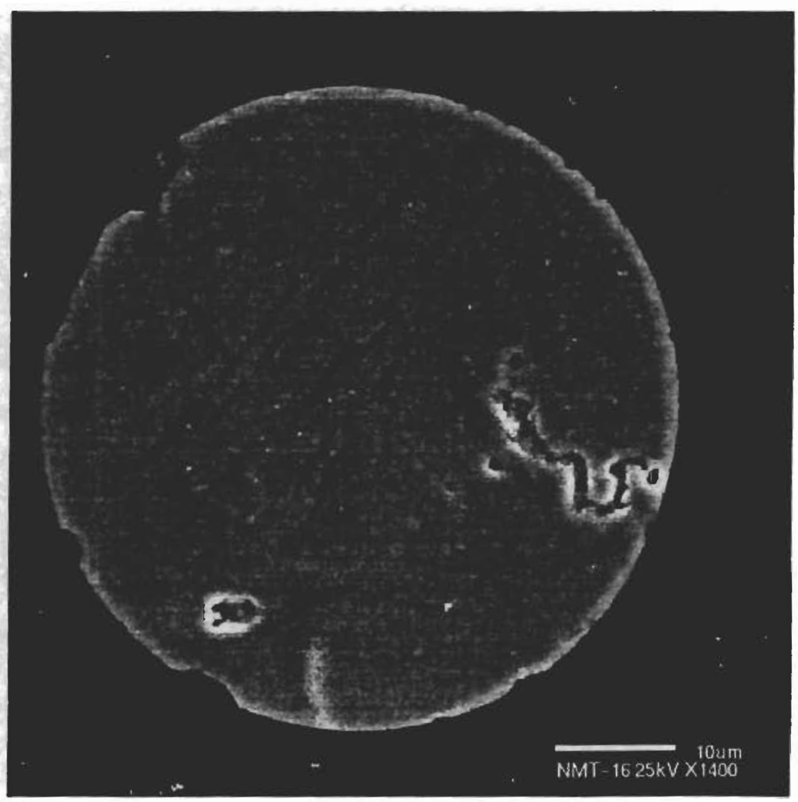
Photograph 6. **Drill rig used for glass coring and associated emission control equipment, MDA V**

Photograph 7. **Homogenous glass core from borehole 21-02-19790. Transitional tuff/glass core is shown on the table.**



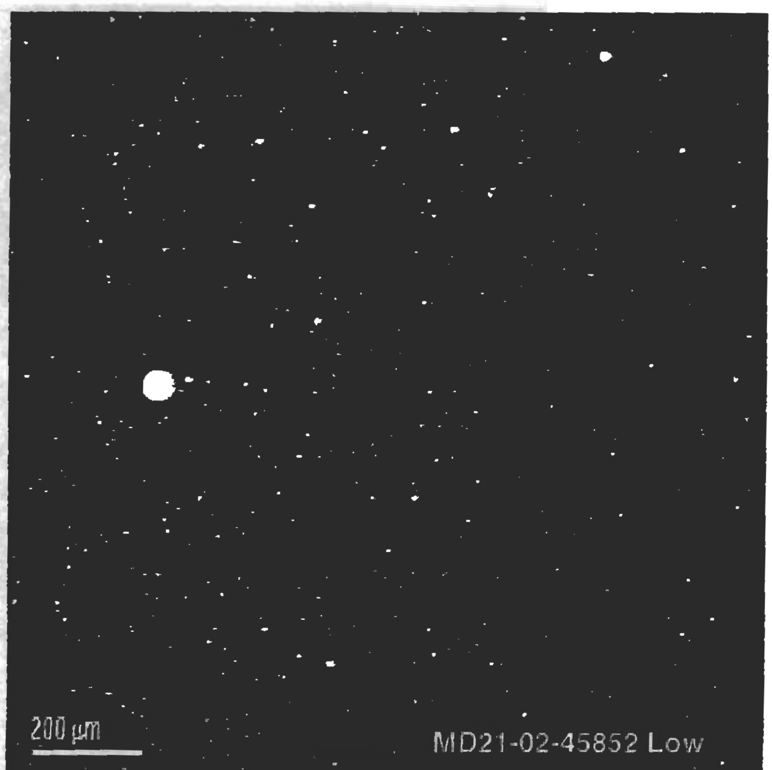
Photograph 8. **Glass core with visible metallic inclusions**

Photograph 9. Fractured zone in borehole 21-02-19790



Photograph 10. High-magnification SEM photo of iron inclusion

Photograph 11. SEM image of homogenous glass



Photograph 12. EMPA image of glass and iron inclusions