Appendixes

Plates

of the investigation activities, the nature and extent of contamination, and additional data requirements. Section 9 presents the recommendations for the sites where the nature and extent of contamination are not defined. Section 10 includes the references cited and the map data sources used in figures and plates.

Appendixes include acronyms, a metric conversion table, and definitions of the data qualifiers used in this report (Appendix A); field methods (Appendix B); sample collection logs (SCLs), chain-of-custody (COC) forms, and analytical suites and results (Appendix C); radiological surveys (Appendix D); IDW management (Appendix E); analytical program (Appendix F) and a summary of sample descriptions and comments from the SCLs (Appendix G).

2.0 BACKGROUND

2.1 TA-21

TA-21 is located on DP Mesa on the northern boundary of the Laboratory and is immediately east-southeast of the Los Alamos townsite (Figure 1.0-1). It extends from the mesa top to the stream channels in two adjacent canyons, DP Canyon to the north and Los Alamos Canyon to the south.

During World War II, the Laboratory was established for the research, development, and testing of the first deliverable nuclear weapon. In 1945, the operations for establishing the chemical and metallurgical properties of the nuclear material necessary to achieve and sustain the nuclear fission reaction were transferred to newly built facilities at TA-21. TA-21 includes five Material Disposal Areas (MDAs): A, B, T, U, and V (Figure 1.0-1).

DP West operations began in September 1945, primarily to produce metal and alloys of plutonium from nitrate solution feedstock provided by other production facilities. This procedure involved several acid dissolution and chemical precipitation steps to separate the plutonium and other valuable actinides from the feedstock. A major research objective at DP West was the development of new purification techniques that would increase the efficiency of the separation processes (Christensen and Maraman 1969, 004779). Details of the purification techniques are discussed in the operable unit work plan for TA-21 (LANL 1991, 007529). Other operations performed at DP West included nuclear fuel reprocessing. In 1977, transfer of work to the new plutonium facility at TA-55 began and much of the DP West complex was vacated.

DP East operations also began in September 1945. These facilities were used to process polonium and actinium and to produce initiators (a nuclear weapons component). In 1964, building 21-209 was built to house research into high-temperature and actinide chemistry. Building 21-155 housed the Tritium Systems Test Assembly (TSTA) for developing and demonstrating effective technology for handling and processing deuterium and tritium fuels used in fusion reactors.

2.2 Consolidated Unit 21-004(b)-99, Aboveground Storage Tanks and Former Outfall

2.2.1 Site Description and Operational History

Consolidated Unit 21-004(b)-99 (Figure 2.2-1) consists of SWMUs 21-004(b) and 21-004(c) and AOC 21-004(d). SWMUs 21-004(b) and 21-004(c) were two aboveground stainless-steel tanks (structure 21-346) that were installed in 1979. These tanks were used as overflow holding tanks for liquid waste from cooling towers and from Laboratory and radionuclide experimental operations in the TSTA facility (building 21-155). Each tank was 9 ft high and 8 ft in diameter with a capacity of 3000 gal. (LANL

1990, 007512). Both tanks were mounted on steel legs above the surface of an asphalt bermed area. The bermed area had a capacity of approximately 9600 gal. and measured 36 ft long by 18 ft wide.

AOC 21-004(d) is the drain line connected to these tanks and an outfall area that was present in 1965 before the tanks were installed. The tanks were connected to the existing vitrified clay outfall pipe and concrete headwall (a small retaining wall placed at the ground surface where the outlet of a stormwater pipe or culvert discharged) by an aboveground 6-in. galvanized pipe that connected to the top of the tanks. The former outfall area [AOC 21-004(d)] was located where the concrete headwall was situated (Figure 2.2-1). The tanks, headwall, waste lines, and asphalt were removed during investigation activities, and the site has been backfilled to the surrounding site grade and seeded.

2.2.2 Relationship to Other SWMUs and AOCs

Consolidated Unit 21-004(b)-99 is located immediately northwest SWMU 21-024(n) and east of SWMU 21-024(h) (Figure 2.2-1). These SWMUs were investigated during the DP Site Aggregate Area investigation, and the results were reported in the Phase II investigation report (LANL 2010, 110772.33).

2.2.3 Summary of Releases

Surface and subsurface contamination may have resulted from undocumented releases to the former outfall area from Laboratory operations that occurred before the aboveground tanks were installed. Unintentional spills and leaks from the tanks may have resulted in surface and subsurface contamination. Subsurface contamination also may have occurred as a result of leaks from the waste lines associated with this consolidated unit.

2.2.4 Previous Investigations

In 1988, a sample was collected 2-ft downslope of the headwall from beneath the outfall pipe (LANL 1991, 007529, p. 15-96). Two boreholes were drilled downslope of tanks 21-346 to a total depth of 5 ft below ground surface (bgs) in the fall of 1994 during Resource Conservation and Recovery Act facility investigation (RFI) activities (LANL 1996, 054828, pp. 32–33). The last samples collected at this consolidated unit were in the fall of 1994.

2.2.5 Historical Nature and Extent of Contamination

Plutonium-239, tritium, and uranium-234 were detected above background values/fallout values (BVs/FVs) in the 1988 sample collected 2 ft downslope of the outfall discharge area (LANL 1991, 007529, p. 15-97). No inorganic chemicals or radionuclides were detected above background in the 1994 RFI samples collected downslope of the tanks (LANL 1996, 054828, pp. 33–34). These data were not included in the data analysis presented in section 7 because they were collected over 15 yr ago.

2.3 SWMU 21-011(b), Acid Waste Lines and Sump

2.3.1 Site Description and Operational History

SWMU 21-011(b) (Figure 2.3-1) consists of an acid waste sump (structure 21-223) and associated waste lines. The sump was located inside a small metal containment building that was located approximately 760 ft east of the TA-21 waste treatment plant (building 21-257) and 70 ft northwest of the TSTA (building 21-155). In 1965, a 4-in. waste line was installed to transport acid waste from building 21-155 to the sump. From the sump, a 3-in. waste line transported acid waste to the old waste treatment

4.2.7 Equipment Decontamination

All field equipment with the potential to contact sample material (e.g., hand augers, sampling scoops, bowls, and core barrel sections) was decontaminated between each sample-collection event and between sampling locations to prevent cross-contamination of samples and sampling equipment. Dry decontamination was performed in accordance with SOP-5061, Field Decontamination of Equipment. Rinsate blanks were collected on sampling equipment to check the effectiveness of decontamination. The decontamination methods are described in Appendix B.

4.2.8 Sample Analyses

All samples were shipped by the SMO to contract analytical laboratories for the requested analyses. The analyses requested were as specified by the approved work plans (LANL 2009, 108166.9; NMED 2010, 108443; LANL 2010, 110082.4; NMED 2010, 110422). The samples were analyzed for all or a subset of the following: target analyte list (TAL) metals, total cyanide, nitrate, pH, perchlorate, explosive compounds, dioxins/furans, polychlorinated biphenyls (PCBs), asbestos, total petroleum hydrocarbons (TPH), diesel range organics (DRO), semivolatile organic compounds (SVOCs), VOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic thorium, isotopic uranium, strontium-90, technetium-99, and tritium.

Field duplicates of investigation samples were analyzed for the same analytical suites as the corresponding investigation samples, as applicable. Equipment rinsate blanks were analyzed for the same inorganic chemical suites as the related investigation samples. Field trip blanks were analyzed only for VOCs. Analytical methods and summaries of data quality are presented in Appendix F. Analytical results (Tables C-1 through C-5), analytical reports, and SCLs/COCs are included on DVD in Appendix C.

4.2.9 Health and Safety

All 2010–2011 investigation activities were conducted in accordance with an approved site-specific health and safety plan and integrated work document that detailed work steps, potential hazards, hazard controls, and required training to conduct work. These health and safety measures included the use of modified Level-D personal protective equipment and field monitoring for organic vapors and gross-alpha and -beta radioactivity using portable air-monitoring systems. No health and safety measures affected or limited task completion.

4.2.10 IDW Management

All IDW generated during the investigation was managed in accordance with SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of applicable U.S. Environmental Protection Agency (EPA) and NMED regulations, DOE orders, and Laboratory implementation requirements, policies, and/or procedures. IDW was also managed in accordance with the approved WCSF. Details of IDW management are presented in Appendix E.

The waste streams associated with the investigation included excavation waste, uncontainerized liquid waste, and contact waste. Each waste stream was containerized and placed in an accumulation area appropriate for the regulatory classification of the waste, in accordance with the approved WCSF (Appendix E).

4.3 Deviations

Deviations occurred while conducting field activities according to the approved work plans (LANL 2009, 108166.9; NMED 2010, 108443; LANL 2010, 110082.4; NMED 2010, 110422). The deviations, necessary to accommodate site-specific field conditions, did not adversely affect the completion or results of the investigation. Deviations to sampling locations and analytical suites are summarized below. In addition, since all boreholes were installed with hand or power augers, there was no collection of cores and a presentation of boring logs (as required by the work plan) was not possible. A summary of sample descriptions and comments from the SCLs (as well as the individual SCLs) is included in Appendix G.

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- At locations 21-614322, 21-614324, 21-614325, and 21-614328, samples were collected from 0 to 1 ft rather than the 0- to 0.5-ft depth to collect adequate material for analyses.
- At location 21-614326, PCBs were inadvertently ordered for analysis in the 5- to 6-ft-depth interval.

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- Because active systems in the vicinity of existing building 21-257 likely intersect the targeted acid waste line, a portion of the acid waste line was left in place. The acid waste line was removed up to the fence line of building 21-257 and MDA T (Figure 2.3-1). The portion of the acid waste line within the fence surrounding building 21-257 was left in place. The remaining line will be removed and proposed locations 30–43 (LANL 2009, 108166.9) will be sampled when building operations have ceased or changed such that active building systems will not interfere with the removal of the line and sampling. The remaining portion of the SWMU contains most of the extended-suite sampling locations; therefore, the total percentage of extended-suite samples will increase to 20% after this SWMU has been completely sampled.
- Sump structure 21-223, which extended at least 15 ft belowgrade, was demolished to below 10 ft belowgrade. The remaining lower portion of this cast-in-place sump had been poured against competent tuff bedrock, so it was left in place. Appendix B, section B-8.0, presents more information. Therefore, proposed sampling location 14 (LANL 2009, 108166.9, Figure 4.1-1) was not sampled. However, as part of the investigation, samples were collected from under the former sump inlet and outlet lines (locations 21-613815, 21-613824, and 21-614319).
- North of former building 21-155, the southwest waste line connecting to manhole structure 21-222 could not be found within approximately 10 ft bgs. Therefore, proposed sampling location 7 (LANL 2009, 108166.9, Figure 4.1-1) was not sampled.
- An approximately 50-ft section of the line on the west side of former building 21-155 was abandoned in place because it was encased in 2 ft of concrete foundation left in place by the D&D operations (Figure 2.3-1). Samples could not be collected at proposed sampling locations 4 and 5 (LANL 2009, 108166.9, Figure 4.1-1).
- Samples from locations 21-613828 and 21-613829 were inadvertently not analyzed for isotopic thorium. However, this does not affect the results because a total of 354 samples were analyzed for isotopic thorium at the sites investigated, with all detections at or below background levels. Therefore, it is unlikely that isotopic thorium would be detected above background at these two locations.