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MAY 15 2015

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Date: MAY 15 2015
Refer To: ADESH-15-034
LAUR: 15-21412
Locates Action No.: N/A

John Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the 2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the 2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project. The objective of this monitoring plan is to evaluate the effects of mitigation measures undertaken in the Los Alamos and Pueblo Canyons watershed under the New Mexico Environment Department–approved Interim Work Plan to Mitigate Contaminated Sediment Transport in the Los Alamos and Pueblo Canyons.

If you have any questions, please contact Steve Veenis at (505) 667-0013 (veenis@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Michael T. Brandt, DrPH, CIH, Associate Director
Environment, Safety, and Health
Los Alamos National Laboratory

Sincerely,

Christine Gelles, Acting Manager
Environmental Management
Los Alamos Field Office

MB/CG/DM/SV:sm

Enclosures: Two hard copies with electronic files – 2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project (EP2015-0031)

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LA-UR-15-21412
May 2015
EP2015-0031

2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

EP2015-0031

2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

May 2015

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
Steve Veenis	Steve Veenis	Project Manager	Environmental Remediation Program	5·6·15

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Randall Erickson	[signature]	Acting Associate Director	Environmental Programs	5/6/15

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
Christine Gelles	[signature]	Acting Manager	DOE-EM-LA	5/15/15

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1.0 INTRODUCTION

The objective of this monitoring plan is to describe methods and frequency of monitoring in the Los Alamos and Pueblo Canyons (LA/P) watershed. This monitoring plan has been developed to satisfy the requirements of the New Mexico Environment Department– (NMED-) approved "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons", (hereafter, the IMWP) (LANL 2008, 101714), and NMED's "Approval with Modification, Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (NMED 2008, 103007). In accordance with these work plans and the approvals, Los Alamos National Laboratory (LANL or the Laboratory) has undertaken several activities to reduce flood energy and associated sediment transport. Because contaminants migrate with sediment entrained in runoff, reduced sediment transport will thus reduce contaminant transport, which is the primary objective of these activities.

Monitoring proposed within this plan is designed to satisfy three purposes:

1. Monitoring is described to support objectives of the IMWP to understand the performance of the controls installed to mitigate sediment transport.
2. Monitoring is described to support the analyses requested by NMED to assess attainment of designated uses.
3. Monitoring is described to satisfy requirements of the memorandum of understanding (MOU) between the U.S. Department of Energy (DOE) and the Buckman Direct Diversion Board (BDDB) regarding water-quality monitoring (hereafter, the MOU between BDDB and DOE) (DOE and BDD Board 2014, 600185).

Three types of monitoring that began in 2010 are designed to meet the objectives of the IMWP: (1) monitoring geomorphic changes in the canyon bottom facilitates continued evaluation of sediment control mitigation measures, (2) collecting and analyzing storm water runoff samples for sediment content supports assessment of the performance of sediment control measures, and (3) collecting and analyzing unfiltered storm water runoff samples to support assessment of the contaminant transport past sediment control mitigation measures.

Monitoring concentrations of dissolved metals and total recoverable metals and other pollutants as requested by NMED in its approval of the 2010 monitoring plan (NMED 2010, 108444) supports the determination of whether or not surface waters of the state are attaining designated uses. Table 1.0-1 provides a summary of annual monitoring plans and approvals under which monitoring has been conducted since 2010.

Analysis of gross beta, radium-226, and radium-228 at gaging stations E050.1 and E060.1 is being performed solely to fulfill requirements of the MOU between BDDB and DOE.

Extensive and intense rain across the Pajarito Plateau during the week of September 10, 2013, resulted in a severe flood in Pueblo Canyon on September 13, 2013. A portion of the Pueblo Canyon wetland experienced a 900-ft advance of a headcut along the canyon's main channel. Several key aspects of the mitigations that were installed in Pueblo Canyon were either damaged or destroyed. Willows planted to improve stream bank stabilization were scoured out or damaged, and the wing ditch installed to divert water out of main channel was damaged. Channel widening and erosion of the south channel bank occurred between the grade-control structure (GCS) and stream gage E060.1. The Pueblo and DP Canyons GCS, the upper Los Alamos Canyon sediment detention basins, and the basins above the

Los Alamos Canyon low-head weir were not damaged and remained operational, although maintenance was performed.

Interim controls were installed in lower Pueblo Canyon to minimize potential impacts from the 2014 monsoon season. Approximately 9500 willows were planted and 2000 linear feet of coir logs were placed along stream banks for stabilization purposes. Gage station E059 located upstream from the GCS was destroyed and was subsequently replaced with E059.5 before the start of 2014 monsoon season. Future mitigation efforts are currently being conducted in Pueblo Canyon to reduce the potential for further headcutting, to stabilize eroded stream banks, and to establish new floodplains that will facilitate deposition in accordance with the U.S. Army Corps of Engineers' request for authorization to conduct stabilization and habitat restoration activities in the Pueblo Canyon water course (LANL 2014, 524744). Storm water and geomorphic monitoring conducted under this 2015 monitoring plan will evaluate the potential impacts of the changes that occurred in the watershed and the efficacy of the mitigations over time.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy. Water-quality results from storm water events are systematically uploaded to the publically accessible environmental monitoring database, Intellus New Mexico.

2.0 MONITORING GEOMORPHIC CHANGES

Monitoring of geomorphic changes (e.g., sediment deposition or erosion) associated with the mitigation measures has been conducted using three methods: (1) repeat cross-section surveys, (2) channel thalweg surveys, and (3) general area surveys. These surveys have been conducted at the locations described below. The surveys have been conducted annually to document geomorphic changes that may have occurred during the previous summer monsoon season. Surveys are conducted between November and April based on the weather, the presence or absence of ponded water in sediment-retention basins, and the ability to work in wetlands after dense vegetation has senesced. Figure 2.0-1 shows the mitigation areas where surveys have been conducted and where repeat surveys are planned in 2015. Potential channel elevation changes (aggradation or incision) will continue to be monitored by directly comparing the previous thalweg elevation at each surveyed cross-section with current survey results.

In July 2014, the Laboratory collected aerial light detecting and ranging (LiDAR) data covering the entire extent of the Los Alamos/Pueblo watershed. LiDAR data were collected at a point density exceeding 8 points per square meter. The Laboratory intends to resurvey Los Alamos/Pueblo watershed in the fall of 2015 using the same point-density specifications. This LiDAR data provides an accurate representation of surface elevation within and outside of the active channel areas of the watershed. For the 2015 monitoring report, the Laboratory intends to evaluate changes in geomorphology within the project area using both LiDAR and total-station-based geomorphic cross-sections surveys at the locations described below.

2.1 Pueblo Canyon

Background Survey Area above WWTF—In Pueblo Canyon Reach P-2W between the confluence of Graduation and Kwage Canyons, three cross-sections were originally surveyed in April and May 2010 (Figure 2.0-1). Three surveys occurred near each of the three cross-vane structures (CVSs): one 50 ft upcanyon and one 50 ft downcanyon of the apex rock of each structure. A longitudinal thalweg profile was also surveyed over these 100-ft intervals. Although the CVSs were damaged during floods in 2010 (LANL 2010, 111125) and have been abandoned, annual resurveys in this area allow monitoring of potential geomorphic changes in Pueblo Canyon upstream from the Los Alamos County Wastewater Treatment Facility (WWTF) outfall. The CVSs no longer exist and therefore are not shown in any figures in this plan.

Upper Pueblo Canyon Willow Planting Survey Area—Between the County WWTF outfall and the access road in Reach P-3E, a total of 18 cross-sections were originally surveyed in October 2009 in the area where willows were planted in spring 2008 and 2009 (Figure 2.0-1). These cross-sections were divided among the upper, middle, and lower thirds of this area. A total of six cross-sections were surveyed in each of these three areas at 100-ft intervals. A longitudinal channel thalweg profile was also surveyed in each of these areas. Annual resurveys at the willow-planting area are intended to document potential geomorphic changes in this area.

Pueblo Canyon Wing Ditch Survey Area—In Pueblo Canyon near the access road in Reach P-3E, five cross-sections were originally surveyed in November 2009 (Figure 2.0-1). These locations were downcanyon from the wing ditch at 100-ft intervals, and a longitudinal channel thalweg profile was also surveyed over this distance. The wing ditch was abandoned when culverts were installed during road reconstruction completed by Los Alamos County in 2011. This area is surveyed annually to allow the monitoring of potential geomorphic changes in this part of the wetland.

Lower Pueblo Canyon Willow Planting Survey Area—In Pueblo Canyon Reaches P-3FE and P-4W, a total of 23 cross-sections were originally surveyed in September and October 2009 at 100-ft intervals for a total of 1100 ft above and below a transition area separating a broad upcanyon wetland (Reach P-3FE) from a narrower downcanyon wetland within incised geomorphic surfaces (Reach P-4W) (LANL 2011, 203661). A headcut advanced through the survey area during the September 13, 2013, flood. Additional bank cross-section surveys conducted above the headcut will be repeated to monitor the effects of stabilization efforts. Annual resurveys in these reaches are intended to monitor geomorphic changes in this portion of Pueblo Canyon, particularly those related to potential changes in the transition area.

Pueblo Canyon GCS Survey Area—A total of 15 cross-sections were originally surveyed in April 2010 at 100-ft intervals for a distance of 1500 ft above the Pueblo Canyon GCS (Figure 2.0-1). Three cross-sections were also surveyed below the GCS at 100-ft intervals to document any changes to the channel downcanyon of the structure. A longitudinal channel thalweg profile was also surveyed in this area. Annual resurveys in this area document any changes in grade and geomorphology above the GCS and to monitor changes in the upcanyon wetland.

2.2 Los Alamos Canyon

DP Canyon GCS Survey Area—In Reach DP-2, a total of 11 cross-sections were originally surveyed in April and May 2010 above the DP Canyon GCS (Figure 2.0-1) at 100-ft intervals upcanyon of the structure. Two cross-sections were also surveyed below the GCS at 100-ft intervals to document any changes to the channel downcanyon of the structure. A longitudinal channel thalweg profile was also surveyed over this area. Annual resurveys in this area are intended to document geomorphic changes above the GCS.

Los Alamos Canyon Low-Head Weir—In 2009, after modifications were made to the sediment-detention basin above the Los Alamos Canyon low-head weir, including establishing three separate basins, an initial topographic survey of this area was conducted in July 2009. The basins were reexcavated in May 2013. Flooding on September 13, 2013, caused a large accumulation of sediments in the three upstream basins. The basins were reexcavated in April/May 2014. Irregular topography associated with basalt mounds and constructed modifications above the weir warrant a more detailed survey than can be conducted with repeat cross-sections. Annual resurveys of this area are intended to document expected sediment accumulation within the basins from monsoon-derived flow in the canyon and the ability of the basins to accept new sediments.

Detention Basins below the 01-001(f) Drainage—A general topographic survey was originally conducted in March 2010 of sediment-detention basins constructed below Solid Waste Management Unit (SWMU) 01-001(f). The basins were reexcavated in June 2011 to prepare for expected floods following the Las Conchas fire, and a new baseline survey was conducted in July 2011. Annual resurveys of this area are intended to document sediment accumulation within the basins and available water storage capacity within the basins.

3.0 MONITORING STORM WATER RUNOFF

In 2015, storm water quality monitoring will be conducted at 12 gage stations (shown in Figure 2.0-1) within the Los Alamos and Pueblo watershed. Each gage station automatically collects storm water runoff using ISCO samplers. Storm water analytical suites for each gage location are presented in Table 3.0-1. Gage locations are sited to monitor sediment transport and water quality effectively throughout each watershed. Results from storm water runoff monitoring will also be available to document baseline conditions upcanyon of these sites and to evaluate contaminant sources. The goal of the sampling is to collect data that (1) represent spatial and temporal variations in potential contaminant concentrations and suspended sediment concentrations (SSC) in storm water; (2) allow evaluation of short-term and long-term trends in SSC, suspended sediment yield, and contaminant concentrations associated with the mitigation sites; (3) provide data to support the determination of whether or not surface waters of the state are attaining designated uses; and (4) meet requirements of the MOU between BDDB and DOE. The monitoring strategy described below was developed to achieve these goals.

3.1 2015 Monitoring Plan Changes

Gage stations E099 and E109.9 were both significantly damaged during the September 13, 2013, flood. The Laboratory subsequently lost administrative access to these gage stations. Therefore, monitoring at these stations was not performed in 2014. Stream stage gaging was restarted at E099 on September 11, 2014, at the NM 502 right of way. Storm water flow at E099 will be monitored as part of the MOU between BDDB and DOE, but storm water samples are not planned for collection or analyses at E099.

This monitoring plan proposes to discontinue sampling for targeted radionuclides before the peak of discharge in each hydrograph. Since 2012, one sample has been planned for collection on the rising limb of the hydrograph near the peak discharge for analyses of gamma-spectroscopy radionuclides and isotopic plutonium instead of SSC. The few samples collected to date have not been useful for estimating sediment transport.

This monitoring plan proposes to discontinue analysis of unfiltered target analyte list (TAL) metals. Instead, this plan proposes analysis of total recoverable selenium, total recoverable aluminum, and total mercury at all locations. Monitoring of dissolved TAL metals plus dissolved boron will continue. The analyses proposed provide results suitable for comparison to applicable New Mexico Water Quality Control Commission surface-water-quality criteria in the Los Alamos and Pueblo watershed.

This monitoring plan focuses planned monitoring and reporting to support the objectives of the IMWP to evaluate the performance of sediment controls, and the results will be reported in the 2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project, to be submitted to NMED on or by March 31, 2016. Monitoring conducted to determine whether or not waters of the state are attaining designated uses will be reported in the 2015 Annual Site Environment Report (ASER), scheduled to be completed on or by September 30, 2016. Monitoring conducted solely to fulfill the requirements of the MOU between BDDB and DOE (DOE and BDD Board 2014, 600185) will be made publically available in IntellusNM only.

3.2 2015 Storm Water Monitoring Locations Inspection, Maintenance, and Sample Retrieval Plan

Storm water monitoring at all locations proposed for 2015 will occur using ISCO type automated pump samplers. Two sampling locations, CO111041 and CO101038 in Figure 3.2-1, are proposed for monitoring at the detention basins below SWMU 01-001(f). Monitoring requirements at these stations are listed in Table 3.0-1. These sampling locations will allow the Laboratory to evaluate how the sediment-detention basins and associated vegetative buffer below the basins are performing. These monitoring locations will be inspected following a rain event exceeding 0.25-in. rain intensity in a 30-min period as recorded at rage gage RG055.5.

All other storm water monitoring will occur at gaging locations. Flow measurement devices and telemetry at gaging stations E050.1 and E060.1 will be inspected at least weekly and after each flow event throughout the year; automated samplers, flow measurement devices and telemetry at other gages will be inspected weekly from June 1 to October 31 and monthly from November 1 to May 31. Equipment found to be damaged or malfunctioning will be repaired within 5 business days after the problem is identified. If the time to repair of monitoring equipment at E050.1 and E060.1 is expected to exceed 48-h, DOE will notify BDD per the MOU between BDDB and DOE. Samples will be retrieved from the field within 1 business day. If collection within 1 business day cannot be not achieved, sample collection will be performed using the following priority order:

- Lower watershed at E042.1, E050.1, E059.5, and E060.1;
- Upper watershed at E026, E055, E055.5, E056, CO101038, and CO111041; and
- DP Canyon at E038 and E039.1.

Deviations from the planned inspection, maintenance, and sample retrieval objectives will be described in the 2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project.

3.3 Storm Water Sampling and Analysis Plan

Evaluation of the performance of sediment controls will be supported by repeat analyses of SSC through each monitored storm at gage stations above and below each GCS and weir. Storm water runoff sampling for SSC analyses at E050.1 and E060.1 will be triggered by discharges of approximately 5 cubic feet per second (cfs). Storm water runoff sampling for SSC at E038 will be triggered by discharges of approximately 40 cfs. Storm water runoff sampling for SSC at E039.1, E059.5, and E042.1 will be triggered by discharges of approximately 10 cfs.

Storm water runoff sampling for chemical and radiochemical analyses at all gage stations will be triggered 10 min after the maximum discharge exceeding the triggering discharge. Sampling at the detention basins below SWMU 01-001(f) will be triggered by a liquid-level actuator that detects the presence of water above the sampler intake. The chemical and radiochemical analyses will be bounded by analysis of SSC to calculate an estimate of the sediment content of each chemical and radiochemical analysis.

Analytical requirements for storm water samples collected to satisfy the three monitoring purposes are consolidated in Table 3.4-1. Samples at gage stations will be collected using automated storm water samplers that contain a carousel of twenty-four 1-L bottles and/or twelve 1-L bottles, as specified in Tables 3.4-2 through 3.4-7. Sample collection inlets will be placed a minimum of 0.33 ft above the bottom of natural stream channels and at 0.17 ft above the bottom of supercritical flumes. The sampling approach summarized above is intended to allow characterization of suspended sediment flux and contaminant concentrations from each portion of the hydrograph, consisting of a

1. rapidly rising limb,
2. short-duration peak,
3. rapidly receding limb following the peak, and
4. longer-duration recessional limb following the peak.

The assignment of samples for chemical and radiochemical analyses to segments of the hydrograph after the peak is consistent with NMED's assertion that "Samples collected before the peak flows are highly variable and have limited value in regard to sediment and contaminant transport evaluations" (NMED 2011, 203705).

To characterize water quality entering and leaving the sediment-detention basins and adjoining vegetative buffer below the SWMU 01-001(f) drainage, automated pump samplers will collect storm water from one location immediately upstream of sediment basin 1 and one location at the terminus of the vegetative buffer up to four times annually when storm water discharge is occurring (Figure 3.2-1). This configuration will continue during the 2015 monitoring effort.

Analytical suites vary according to monitoring groups and are based on key indicator contaminants, NMED requests, and the MOU between BDDB and DOE for given portions of each watershed. Table 3.0-1 shows the monitoring groups, the analytical suite for each location, and the reason for monitoring each suite. Evaluation of analytical results will determine the quality of correlations existing between contaminant concentrations and SSCs. The results of SSC analyses will be used to calculate the total mass/activity transported during storm water runoff events at the gage stations. Particle-size analyses conducted in conjunction with selected SSC analyses will support characterization of chemicals and radionuclides.

The list of analytical suites for each monitoring group presented in Table 3.0-1 is prioritized to guide what analyses will be conducted if the water volume collected from a storm event is not sufficient for all the planned suites. The analytical method, expected method detection limit (MDL), and minimal detectable activity (MDA) (for radionuclides) are presented in Table 3.4-1. The sampling sequence for CO101038 and CO111041 is presented in Table 3.4-2. The sampling sequence for E026, E030, E055, E055.5, and E056 is presented in Table 3.4-3. Table 3.4-4 provides the sampling sequence at E038, E039.1, and E040. Table 3.4-5 provides the sampling sequence at E042.1. Table 3.4-6 provides the sampling sequence at E059.5. Table 3.4-7 provides the sampling sequence at E050.1 and E060.1. Samples will be submitted for chemical and radiochemical analyses at gage stations E038, E059.5, and E042.1 if samples were collected during an event at their paired downstream gages (E039.1, E060.1, and E050.1, respectively).

Total suspended sediment transport during a storm event is determined most accurately when discharge is sampled periodically for SSC analysis throughout the hydrograph. Samples for SSC measurements will be collected at 2-min intervals for the first 30 min, then at 20-min intervals for the following 160 min if runoff is available. Repeat measurements will be taken above and below the DP Canyon GCS at E038 and E039.1, above and below the Los Alamos Canyon low-head weir at E042.1 and E050.1, and above and below the Pueblo Canyon GCS at E059.5 and E060.1 to better characterize the performance of the structures. At these stations, a second sampler is dedicated to collecting storm water for SSC analyses with the objective of representing most or all of the duration of runoff. Collecting SSC samples at 2-min intervals during the first 30 min allows for better characterization of the early part of the hydrograph and provides samples for the radiochemical analyses before the discharge peak.

Except at E050.1 and E060.1, where all events are monitored for all parameters, if four runoff events have been sampled at a gage station during the monitoring year, subsequent events with discharge less than the largest discharge of the sampled storm events will be analyzed for SSC only. At upper watershed gage stations where a single sampler containing a carousel of twelve 1-L bottles is installed, following collection of samples from four storm events, the first and last sample collected will be analyzed for SSC and other analyses will not be performed. At locations where a sampler containing a carousel of twenty-four 1-L bottles is installed and dedicated to collecting samples throughout the entire hydrograph (i.e., upstream and downstream of watershed mitigations), following collection of samples from four storm events, one sample from each of the four portions of the hydrograph from these subsequent storms will be analyzed for SSC and other analyses will not be performed. In this way, SSC analyses are obtained at different times during the hydrograph, and suspended sediment transport for the entire storm event can be characterized.

3.4 Discharge Gaging

Each of the stream gages listed in Table 3.0-1 and gage E099 will be monitored continuously throughout the year. Rating curves are used to convert stage to discharge. Rating curves for the gage stations are updated following channel-forming flood events.

3.5 Inspections of Erosion and Sediment Control Structures

Erosion and sediment control structures and monitoring stations will be inspected after storm events exceeding 50 cfs, or other channel-forming flood events, within 3 business days. Repairs will be made as necessary to ensure such structures and other storm water mitigation features continue to function as intended.

3.6 Sediment Sampling and Analysis Plan

Sediment sampling is conducted annually within the Los Alamos/Pueblo watershed as part of voluntary monitoring conducted for the ASER. The results of this voluntary or NMED-directed sediment sampling occurring in 2015 will be presented in the 2015 ASER.

4.0 REPORTING

All data collected as part of this 2015 monitoring plan to support objectives of the IMWP to understand the performance of the controls installed to mitigate sediment transport will be presented in the 2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project, to be submitted to NMED by March 31, 2016. The 2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project will also be submitted to NMED by March 31, 2016. Monitoring conducted as part of this 2015 monitoring plan to determine whether or not waters of the state are attaining designed uses will be reported in the 2015 ASER, to be submitted on or by September 30, 2016. Monitoring conducted as part of this 2015 monitoring plan solely to fulfill requirements of the MOU between BDDB and DOE will be made publically available in IntellusNM only.

5.0 REFERENCES

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

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

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NMED (New Mexico Environment Department), January 11, 2010. "Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 108444)

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NMED (New Mexico Environment Department), January 23, 2013. "Approval, 2012 Monitoring Plan for Los Alamos and Pueblo Canyons, Sediment Transport Mitigation Project, Revision 2," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 521854)

NMED (New Mexico Environment Department), July 19, 2013. "Approval, 2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 523106)

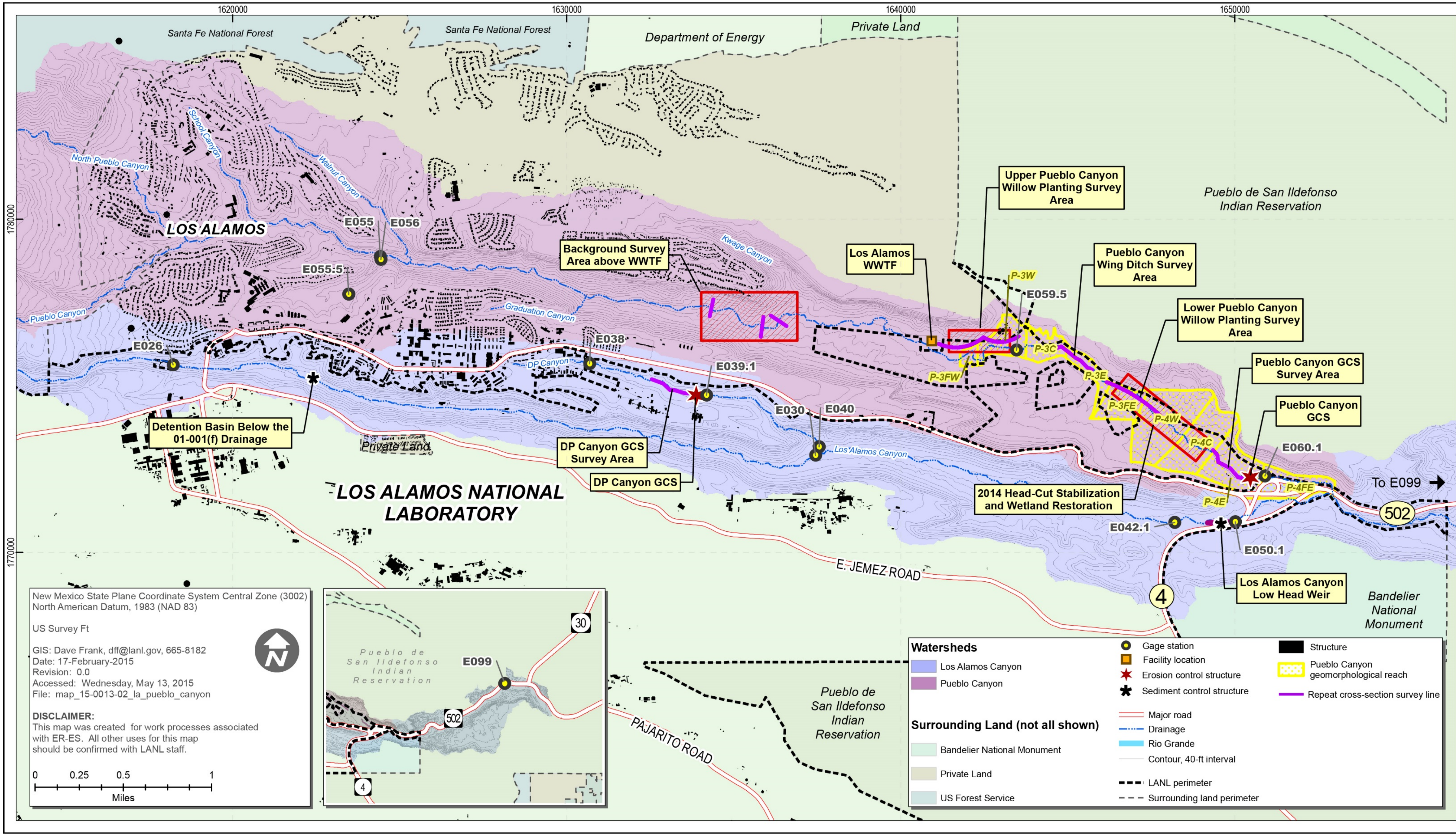

Figure 2.0-1 Monitoring locations and sediment trap mitigation sites in Los Alamos and Pueblo Canyons

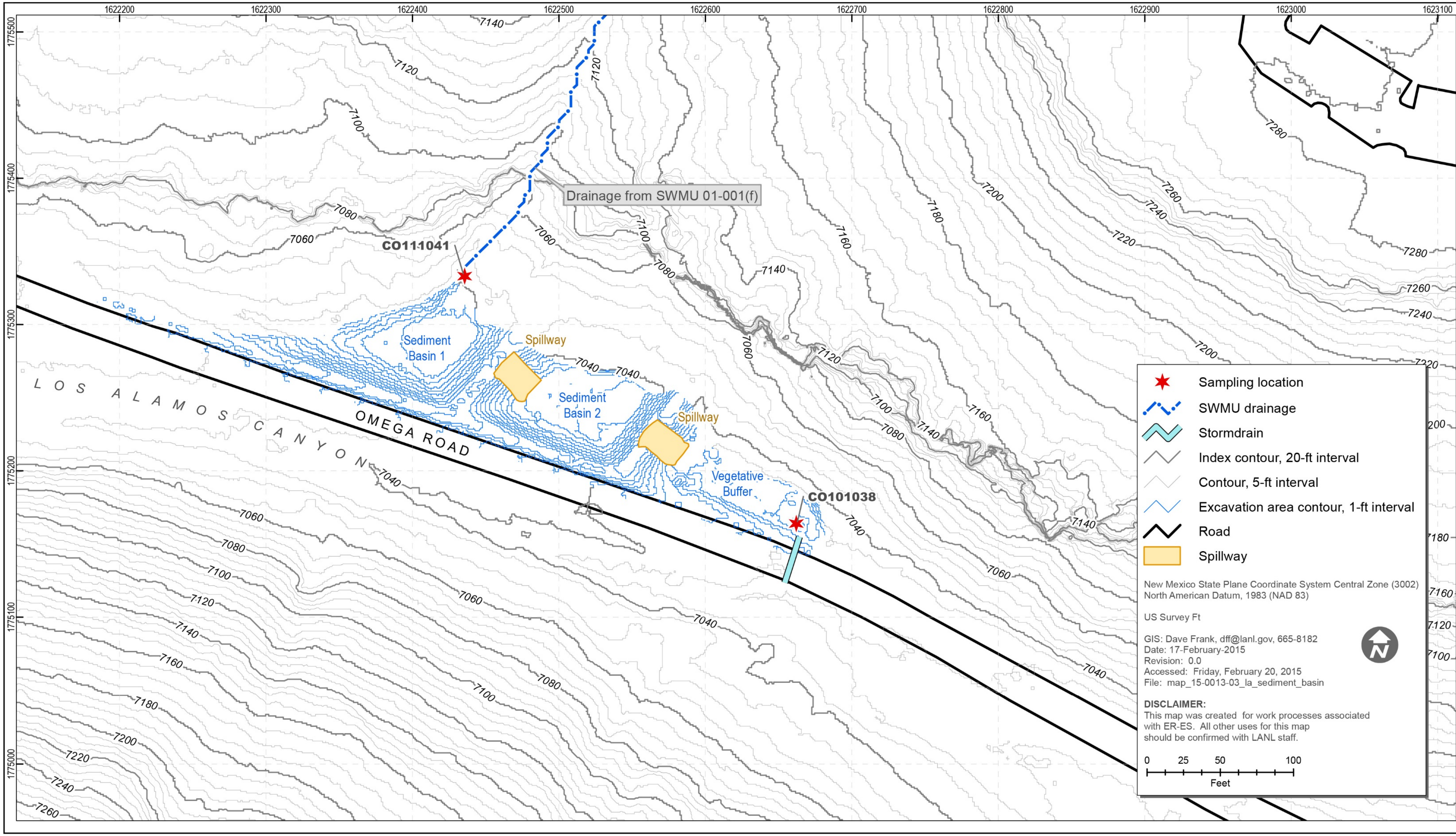

Figure 3.2-1 Detention basins and sampling locations below the SWMU 01-001(f) drainage

Table 1.0-1
Monitoring Plans Submitted since 2010

Monitoring Year	Monitoring Plan Name	ERID/ESH Reference Number – Date Submitted	Approval	Approval Reference Number – Approval Date
2010	Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	107457 – 10/15/2009	Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan	108444 – 1/11/2010
2011	2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	201578 – 3/23/2011	Approval with Modifications [for the] 2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	203705 – 6/3/2011
2012	2012 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 2	222833 – 9/28/2012	Approval [for the] 2012 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 2	521854 – 1/23/2013
2013	2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1	243432 – 6/21/2013	Approval [for the] 2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1	523106 – 7/19/2013
2014	2014 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	243432 – 5/15/2014	Neither approved or denied	n/a*

*n/a = Not applicable.

Table 3.0-1
Locations and Analytical Suites for Storm Water Samples

Monitoring Group	Locations	Analytical Suites[a]		
		Evaluation of Sediment Control Performance	**Evaluation of Water-Quality Criteria**	**MOU between BDDB and DOE**
Upper Los Alamos Canyon gages	E026, E030	PCBs[b] (by Method 1668A), gamma spectroscopy, dioxin/furans, strontium-90, radionuclides, isotopic plutonium, isotopic uranium, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite[c]	n/a[d]
DP Canyon gages	E038, E039.1, E040	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Upper Pueblo Canyon and Acid Canyon gages	E055, E055.5, E056	PCBs (by Method 1668A), isotopic plutonium, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Los Alamos Canyon gages	E042.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), isotopic uranium, dioxins/furans, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Los Alamos Canyon gages	E050.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), isotopic uranium, dioxins/furans, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	PCBs (by Method 1668A), dioxins/furans, gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, gross alpha, gross beta, radium-226/radium-228, TAL metals, hardness, SSC, particle size

Table 3.0-1 (continued)

Monitoring Group	Locations	Analytical Suites[a]		
		Evaluation of Sediment Control Performance	Evaluation of Water-Quality Criteria	MOU between BDDB and DOE
Lower Pueblo Canyon gages	E059.5	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), isotopic uranium, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Pueblo Canyon gages	E060.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), isotopic uranium,strontium-90, SSC, particle size	Dissolved TAL metals+ B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	PCBs (by Method 1668A), dioxins/furans, gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, gross alpha, gross beta, radium-226/radium-228, TAL metals, hardness, SSC, particle size
Detention basins and vegetative buffer below the SWMU 01-001(f) drainage	CO101038, CO111041	PCBs (by Method 1668A), total organic carbon, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a

[a] Suites are listed in order of priority to guide analysis of limited water volume. SSC and particle size are independent of prioritization because they are derived from separate sample bottles.

[b] TAL = Target analyte list; hardness is calculated from calcium and magnesium, components of the TAL list. TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn.

[c] BLM suite = Biotic Ligand Model (BLM) suite, which includes dissolved organic carbon, chloride, sulfate, alkalinity, and pH.

[d] n/a = Not applicable.

Table 3.4-1
Analytical Requirements for Storm Water Samples

Analytical Suite	Method	Contract Required Reporting Limit	Typical Detection Limit in Storm Water[a]	Upper Los Alamos Canyon	DP Canyon	Upper Pueblo Canyon and Acid Canyon	Lower Los Alamos Canyon	Lower Pueblo Canyon	BDD-Required Monitoring	Detention Basins below the SWMU 01-001(f) Drainage
PCBs[b]	EPA:1668A	na[c]	25 pg/L	X[d]	X	X	X	X	X	X
Isotopic plutonium	HASL-300	0.075 pCi/L	0.5 pCi/L	X	X	X	X	X	X	—[e]
Gamma spectroscopy	EPA:901.1	8 pCi/L (cesium-137)	10 pCi/L (cesium-137)	X	X	—	X	X	X	—
Isotopic uranium	HASL-300	0.1 pCi/L	0.5 pCi/L	X	X	—	X	X	X	X
Americium-241	HASL-300	0.075 pCi/L	0.5 pCi/L	—	—	—	X	X	X	—
Strontium-90	EPA:905.0	0.5 pCi/L	0.5 pCi/L	X	X	—	X	X	X	—
TAL[f] metals + B + U	EPA:200.7/200.8/245.2	Variable	Variable	X	X	X	X	X	X	X
Dioxins and furans	EPA:1613B	10–50 ng/L	50 pg/L	X	—	—	X	—	X	—
Gross alpha	EPA:900	3 pCi/L	10 pCi/L	X	X	X	X	X	X	X
Gross beta	EPA:900	3 pCi/L	10 pCi/L	—	—	—	—	—	X	—
Radium-226/radium-228	EPA:903.1/EPA:904	1 pCi/L	0.5/0.5 pCi/L	—	—	—	—	—	X	—
SSC	EPA:160.2	3 mg/L	10 mg/L	X	X	X	X	X	X	X
Particle size	ASTM:C1070	na	0.01%	X	X	X	X	X	X	X
Alkalinity	EPA:310	na	na	X	X	X	X	X	X	X
pH	EPA:150.1	na	na	X	X	X	X	X	X	X
Chloride	EPA:300	na	0.1 mg/L	X	X	X	X	X	X	X
Sulfate	EPA:300	na	0.5 mg/L	X	X	X	X	X	X	X
Dissolved organic carbon	EPA:415.1	na	0.5 mg/L	X	X	X	X	X	X	X

[a] MDL or MDA for radionuclides.

[b] PCBs = Polychlorinated biphenyls.

[c] na = Not available.

[d] X = Monitoring planned.

[e] — = Monitoring not planned.

[f] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

Table 3.4-2
Sampling Sequence for Collection of Storm Water Samples at the Detention Basins and Vegetative Buffer below the SWMU 01-001(f) Drainage

Sample Bottle (1 L)	CO101038, CO111041		Target Report
	Start Time (min) 12-Bottle ISCO	Analytical Suite	
1	Trigger	SSC; particle size	LA/P
2	Trigger +1	PCBs[a] (UF[b])	LA/P
3	Trigger +2		
4	Trigger +3	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER
5	Trigger +4	Gross alpha (UF)	ASER
6	Trigger +5	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER
7	Trigger +6	Isotopic uranium (UF)	LA/P
8	Trigger +7	SSC	LA/P
9	Trigger +8	DOC[f] (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER
10	Trigger +9	Extra bottle	n/a[g]
11	Trigger +10	Extra bottle	n/a
12	Trigger +11	Extra bottle	n/a

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] DOC = Dissolved organic carbon.

[g] n/a = Not applicable.

Table 3.4-3
Sampling Sequence for Collection of
Storm Water Samples at E026, E030, E055, E055.5, and E056

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E026 and E030 Analytical Suites	E026 E030 Target Report	E055, E055.5, and E056 Analytical Suites	E055 E055.5 E056 Target Report
1	Max+10	SSC, particle size	LA/P	SSC; particle size	LA/P
2	Max+11	PCBs[a] (UF[b])	LA/P	PCB (UF)	LA/P
3	Max+12				
4	Max+13	Gamma spectroscopy (UF) + gross alpha (UF) + isotopic plutonium (UF)	LA/P & ASER	Isotopic plutonium (UF) + gross alpha (UF)	LA/P
5	Max+14				
6	Max+15	Strontium-90 (UF)	LA/P	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER
7	Max+16	Dioxins and furans (UF)	LA/P	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER
8	Max+17			SSC	LA/P
9	Max+18	TAL metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	LA/P
10	Max+19	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER	Extra bottle	n/a[f]
11	Max+20	SSC	LA/P	Extra bottle	n/a
12	Max+21	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER	Extra bottle	n/a

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] n/a = Not applicable.

Table 3.4-4
Sampling Sequence for Collection of Storm Water Samples at E038, E039.1, and E040

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E038 and E039.1 Analytical Suites	Target Report	E040 Analytical Suites	Target Report	E038 and E039.1 Target Report: LA/P Start Time (min) 24-Bottle ISCO	E038 and E039.1 Target Report: LA/P Analytical Suites 24-Bottle ISCO 1-L Poly Wedge
1	Max+10	PCBs[a] (UF[b])	LA/P	SSC; particle size	LA/P	Trigger	SSC
2	Max+11			PCBs (UF)	LA/P	Trigger+2	SSC
3	Max+12	Gamma spectroscopy (UF) + gross alpha (UF)	LA/P & ASER			Trigger+4	SSC
4	Max+13	Isotopic plutonium (UF)	LA/P	Gamma spectroscopy (UF) + gross alpha (UF)	LA/P & ASER	Trigger+6	SSC
5	Max+14			Isotopic plutonium (UF)	LA/P	Trigger+8	SSC
6	Max+15	Strontium-90 (UF)	LA/P			Trigger+10	SSC
7	Max+16	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	Strontium-90 (UF)	LA/P	Trigger+12	SSC
8	Max+17	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER	TAL metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	Trigger+14	SSC
9	Max+18	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER	Trigger+16	SSC
10	Max+19	Extra bottle	n/a[f]	SSC	LA/P	Trigger+18	SSC; particle size
11	Max+20	Extra bottle	n/a	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER	Trigger+20	SSC
12	Max+21	Extra bottle	n/a	Extra bottle	n/a	Trigger+22	SSC
13	n/a[e]	n/a	n/a	n/a	n/a	Trigger+24	SSC
14	n/a	n/a	n/a	n/a	n/a	Trigger+26	SSC
15	n/a	n/a	n/a	n/a	n/a	Trigger+28	SSC
16	n/a	n/a	n/a	n/a	n/a	Trigger+30	SSC
17	n/a	n/a	n/a	n/a	n/a	Trigger+50	SSC
18	n/a	n/a	n/a	n/a	n/a	Trigger+70	SSC

Table 3.4-4 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E038 and E039.1	Target Report	E040	Target Report	E038 and E039.1 Target Report: LA/P	
		Analytical Suites		Analytical Suites		Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge
19	n/a	n/a	n/a	n/a	n/a	Trigger+90	SSC
20	n/a	n/a	n/a	n/a	n/a	Trigger+110	SSC
21	n/a	n/a	n/a	n/a	n/a	Trigger+130	SSC
22	n/a	n/a	n/a	n/a	n/a	Trigger+150	SSC
23	n/a	n/a	n/a	n/a	n/a	Trigger+170	SSC
24	n/a	n/a	n/a	n/a	n/a	Trigger+190	SSC

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] n/a = Not applicable.

Table 3.4-5
Sampling Sequence for Collection of Storm Water Samples at E042.1

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
1	Max+10	PCBs[a] (UF[b])	LA/P	Trigger	SSC	LA/P
2	Max+11		LA/P	Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF) + gross alpha (UF)	LA/P & ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF), americium-241 (UF)	LA/P	Trigger+6	SSC	LA/P
5	Max+14		LA/P	Trigger+8	SSC	LAP
6	Max+16	Dioxins/furans (UF)	LA/P	Trigger+10	SSC	LA/P
7	Max+17	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	Trigger+12	SSC	LA/P
8	Max+18	Strontium-90 (UF)	LAP	Trigger+14	SSC	LA/P
9	Max+60	PCBs (UF)	LA/P	Trigger+16	SSC; particle size	LA/P
10	Max+61	Isotopic plutonium (UF)	LA/P	Trigger+18	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER
11	Max+105	PCBs (UF)	LA/P	Trigger+20	SSC	LA/P
12	Max+106	Isotopic plutonium (UF)	LA/P	Trigger+22	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER
13	n/a[f]	n/a	n/a	Trigger+24	SSC	LA/P
14	n/a	n/a	n/a	Trigger+26	SSC	LA/P
15	n/a	n/a	n/a	Trigger+28	SSC	LA//P
16	n/a	n/a	n/a	Trigger+30	SSC	LA/P
17	n/a	n/a	n/a	Trigger+50	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+70	SSC	LA/P
19	n/a	n/a	n/a	Trigger+90	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+110	SSC	LA/P
21	n/a	n/a	n/a	Trigger+130	SSC	LA/P

Table 3.4-5 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
22	n/a	n/a	n/a	Trigger+150	SSC	LA/P
23	n/a	n/a	n/a	Trigger+170	SSC	LA/P
24	n/a	n/a	n/a	Trigger+190	SSC	LA/P

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] n/a = Not applicable.

Table 3.4-6
Sampling Sequence for Collection of Storm Water Samples at E059.5

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
1	Max+10	PCBs[a] (UF[b])	LA/P	Trigger	SSC	LA/P
2	Max+11		LA/P	Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF) + gross alpha (UF)	LA/P & ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF), americium-241 (UF)	LA/P	Trigger+6	SSC	LA/P
5	Max+14		LA/P	Trigger+8	SSC	LA/P
6	Max+16	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	Trigger+10	SSC	LA/P
7	Max+17	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER	Trigger+12	SSC	LA/P
8	Max+18	Strontium-90 (UF)	LA/P	Trigger+14	SSC	LAP
9	Max+60	PCBs (UF)	LA/P	Trigger+16	SSC; particle size	LA/P
10	Max+61	Isotopic plutonium (UF)	LA/P	Trigger+18	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER
11	Max+105	PCBs (UF)	LA/P	Trigger+20	SSC	LA/P
12	Max+106	Isotopic plutonium (UF)	LA/P	Trigger+22	SSC	LA/P
13	n/a[f]	n/a	n/a	Trigger+24	SSC	LA/P
14	n/a	n/a	n/a	Trigger+26	SSC	LA/P
15	n/a	n/a	n/a	Trigger+28	SSC	LA/P
16	n/a	n/a	n/a	Trigger+30	SSC	LA/P
17	n/a	n/a	n/a	Trigger+50	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+70	SSC	LA/P
19	n/a	n/a	n/a	Trigger+90	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+110	SSC	LA/P
21	n/a	n/a	n/a	Trigger+130	SSC	LA/P
22	n/a	n/a	n/a	Trigger+150	SSC	LA/P

Table 3.4-6 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
23	n/a	n/a	n/a	Trigger+170	SSC	LA/P
24	n/a	n/a	n/a	Trigger+190	SSC	LA/P

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] n/a = Not applicable.

Table 3.4-7
Sampling Sequence for Collection of Storm Water Samples at E050.1 and E060.1

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E050.1 and E060.1 Analytical Suites 12-Bottle ISCO	E050.1 E060.1 Target Report	E050.1 and E060.1 Start Time (min) 24-Bottle ISCO	E050.1 and E060.1 Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	E050.1 E060.1 Target Report
1	Max+10	PCBs[a] (UF[b])	LA/P	Trigger	SSC	LA/P
2	Max+11			Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF) + gross alpha (UF)	LA/P & ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF), americium-241 (UF), isotopic uranium (UF)	LA/P	Trigger+6	SSC	LA/P
5	Max+14			Trigger+8	Radium-226 (UF)	BDD
6	Max+16	Strontium-90 (UF)	LA/P	Trigger+12	Radium-228 (UF)	BDD
7	Max+17	TAL[c] metals + B + U + hardness (F[d]), total recoverable aluminum (F[e])	ASER	Trigger+14	SSC	LA/P
8	Max+18	Dioxins/furans (UF)	LA/P	Trigger+16	Gross beta (UF)	BDD
9	Max+60	PCB (UF)	LA/P	Trigger+18	Total recoverable selenium (UF), total mercury (UF), total uranium (UF)	ASER
10	Max+61	Isotopic plutonium (UF)	LA/P	Trigger+20	SSC; particle size	LA/P
11	Max+105	PCB (UF)	LA/P	Trigger+22	DOC (F) + chloride (F) + sulfate (F) + alkalinity (UF) + pH (UF)	ASER
12	Max+106	Isotopic plutonium (UF)	LA/P	Trigger+24	SSC	LA/P
13	n/a[f]	n/a	n/a	Trigger+26	SSC	LA/P
14	n/a	n/a	n/a	Trigger+28	SSC	LA/P
15	n/a	n/a	n/a	Trigger+30	SSC	LA/P
16	n/a	n/a	n/a	Trigger+50	SSC	LA/P
17	n/a	n/a	n/a	Trigger+70	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+90	SSC	LA/P
29	n/a	n/a	n/a	Trigger+110	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+130	SSC	LA/P

Table 3.4-7 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E050.1 and E060.1 Analytical Suites 12-Bottle ISCO	E050.1 E060.1 Target Report	E050.1 and E060.1 Start Time (min) 24-Bottle ISCO	E050.1 and E060.1 Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	E050.1 E060.1 Target Report
21	n/a	n/a	n/a	Trigger+150	SSC	LA/P
21	n/a	n/a	n/a	Trigger+170	SSC	LA/P
23	n/a	n/a	n/a	Trigger+190	SSC	LA/P
24	n/a	n/a	n/a	Trigger+210	SSC	LA/P

[a] PCBs = Polychlorinated biphenyls.

[b] UF = Unfiltered.

[c] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[d] F = Filtered using 0.45-µm filter membrane.

[e] F = Filtered using 10-µm filter membrane.

[f] n/a = Not applicable.