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# 2013 Excavation of the Los Alamos Canyon Low-Head Weir

Prepared by the Environmental Programs Directorate

## 2013 EXCAVATION OF THE LOS ALAMOS CANYON LOW-HEAD WEIR

Excavation of the basins behind the Los Alamos Canyon low-head weir began on April 1, 2013, and was completed on May 6, 2013. The basins were excavated to maximize the sediment-retention capacity for the 2013 summer monsoon season. Much of the total available capacity had been lost as a result of sediment accumulation that followed the Las Conchas fire. An estimated 6000 $yd^3$ (including postexcavation expansion) of sediment was removed from the three basins, transported approximately 0.5 mi up Los Alamos Canyon, and stockpiled at a former borrow pit (Figures 1 and 2). The borrow pit provides an ideal location for the disposition of the excavated sediment because of its available capacity and its isolation from potential storm water runoff. A layer of sediment approximately 6 in. thick was retained in the bottom of each basin to mitigate against potential infiltration into underlying bedrock (Figures 2 through 5).

Before excavation, samples were collected to characterize the material planned for excavation. Depth-integrated samples were collected for analysis to represent the mixed condition of excavated sediment. Sampling included collecting a significant component of finer-grained deposits that likely provide an upper bound of constituent concentrations. The data are provided on a CD and attached to this document.

A screening comparison was conducted to support decisions regarding disposition of the excavated sediment. The approach used for the analysis is consistent with the approach taken to evaluate the same type of sediment deposits behind the low-head weir structure in 2009 (LANL 2009, 105294).

The data were first compared with sediment background values (BVs) (LANL 1998, 059730) or detection limits (for organic chemicals), and those values that exceeded BVs and detected organic chemicals (chemicals of potential concern [COPCs]) were compared with the residential soil screening levels (SSLs)/screening action levels (SALs) (LANL 2012, 228852; NMED 2012, 219971) and minimum ecological screening levels (ESLs) (LANL 2012, 226667) (Table 1).

The following is a summary of the assessment:

- 51 analytes were detected.
    - ❖ For the 13 detected dioxin and furan congeners, the 2,3,7,8-tetrachlorodibenzodioxin–(TCDD-) equivalent concentration for mammals was calculated from the toxic equivalency factors referenced in NMED guidance (2012, 219971).
- 22 detected analytes were identified as COPCs.
- Maximum COPC concentrations were not greater than residential SSLs/SALs and therefore no potential unacceptable human health risks are present for the materials behind the low-head weir.
- Maximum concentrations of barium, copper, cyanide, lead, manganese, nickel, zinc, and TCDD were greater than the respective minimum ESLs.

COPCs with concentrations greater than the minimum ESLs were further evaluated to determine if they have the potential for causing ecological risk (chemicals of potential ecological concern [COPECs]). The approach taken in this assessment was to compare measured concentrations for a given COPEC with the lowest effect level ESLs (L-ESLs).

Table 2 lists the maximum concentrations of barium, copper, cyanide, lead, manganese, nickel, zinc, and TCDD. For comparison, the sediment and soil BVs as well as the minimum ESLs and L-ESLs are provided. In addition, the maximum concentrations measured in 2009 from the weir are presented as well as the maximum concentrations measured in postfire ash (samples collected after the Cerro Grande fire) (LANL 2004, 087390) because of the high ash content in the weir sediment.

The hazard quotient (HQ) is calculated by dividing the maximum concentration of each COPEC measured in 2013 by the minimum ESL or L-ESL. The HQs for the minimum ESLs are all greater than 1; the HQs for the minimum L-ESLs are less than 1 for copper, nickel, zinc, and TCDD; and the HQs for the minimum L-ESLs are slightly above 1 for barium, cyanide, lead, and manganese. The latter COPECs are discussed below.

- **Barium**: All detected concentrations are above the sediment BV but below the soil BV. The minimum ESL is below the sediment and soil BVs, and the L-ESL is below the soil BV. The maximum HQ based on the L-ESL is 1.1, and the mean HQ is 0.9. Higher concentrations were measured in postfire ash after the Cerro Grande fire (LANL 2004, 087390), indicating the ash is a source of barium in the weir. Therefore, there are no potential ecological risks from barium.
- **Cyanide**: Five of six detected concentrations are above the sediment BV, and all are above the soil BV. The minimum ESL is below the sediment and soil BVs, and the L-ESL is 0.18 mg/kg above the sediment BV. The maximum HQ based on the L-ESL is 1.4, and the mean HQ is 1.1; both are equivalent to 1. Therefore, there are no potential ecological risks from cyanide.
- **Lead**: All detected concentrations are above the sediment and soil BVs, but five of six concentrations are below the maximum soil background concentration. The minimum ESL is below the sediment and soil BVs, and the L-ESL is 8.3 mg/kg above the sediment BV and 5.7 mg/kg above the soil BV but the same as the maximum soil background concentration. The maximum HQ based on the L-ESL is 1.3, and the mean HQ is 1. Higher concentrations were measured in postfire ash after the Cerro Grande fire (LANL 2004, 087390), indicating the ash is a source of lead in the weir. Therefore, there are no potential ecological risks from lead.
- **Manganese:** All detected concentrations are above the sediment and soil BVs, but three of six concentrations are below the maximum soil background concentration. The minimum ESL is below the sediment and soil BVs, and the L-ESL is above the sediment and soil BVs but the same as the maximum soil background concentration. The maximum HQ based on the L-ESL is 1.2, and the mean HQ is 1. Higher concentrations were measured in postfire ash after the Cerro Grande fire (LANL 2004, 087390), indicating the ash is a source of manganese in the weir. Therefore, there are no potential ecological risks from manganese.

## REFERENCES

*The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the 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.*

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

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LANL (Los Alamos National Laboratory), October 2012. "Derivation and Use of Radionuclide Screening Action Levels, Revision 2," Los Alamos National Laboratory document LA-UR-12-23292, Los Alamos, New Mexico. (LANL 2012, 228852)

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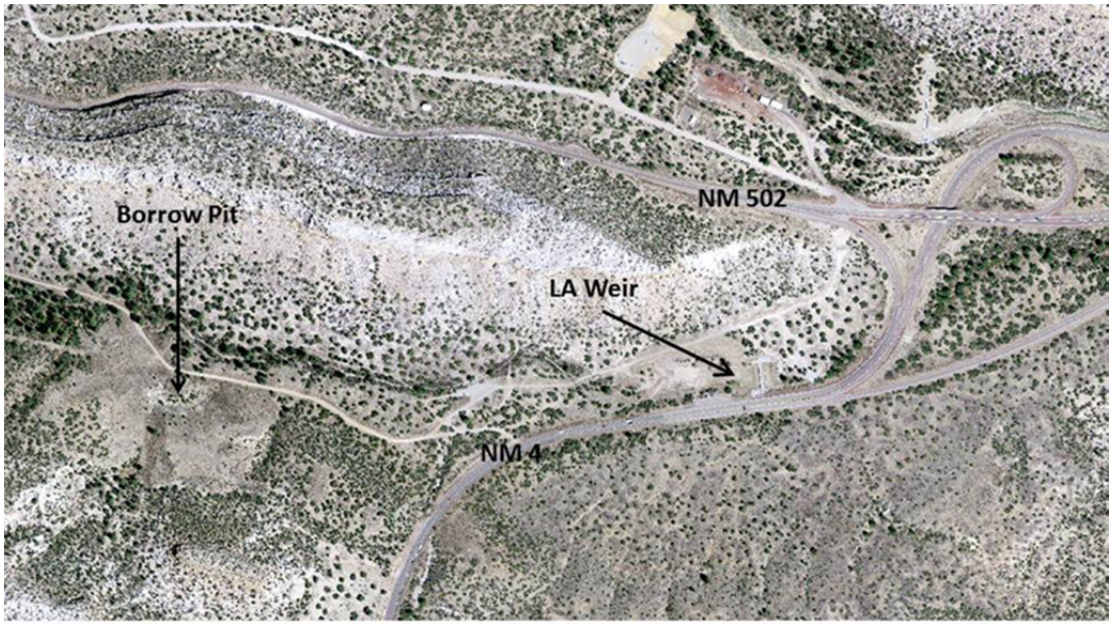


**Figure 1** **Orthophoto map showing locations of the Los Alamos Canyon weir and borrow pit near intersection of NM 502 and NM 4**

**Figure 2** **Excavated sediment being placed in former borrow pit in Los Alamos Canyon**

**Figure 3** **Sediment removal activities in basin 3**


**Figure 4** **Postexcavation view upcanyon from weir. Basin 3 is in the foreground.**


**Figure 5 Postexcavation view downcanyon into basin 3**

**Table 1**
**Comparison of Maximum Detected Concentrations in**
**Depth-Integrated Samples to Sediment BVs, Residential SSLs/SALs, and Minimum ESLs**

| Analyte | Analyte Code | Units | Maximum Concentration | Canyon Sediment BVs[a] | Residential SSL[b] or SAL[c] | Minimum ESL[d] |
|---|---|---|---|---|---|---|
| Aluminum | Al | mg/kg | 14,500 | 15,400 | n/a[e] | n/a |
| Arsenic | As | mg/kg | 2.8 | 3.98 | n/a | n/a |
| Barium | Ba | mg/kg | 275 | 127 | 15,600 | 110 |
| Beryllium | Be | mg/kg | 1.82 | 1.31 | 156 | 2.5 |
| Cadmium | Cd | mg/kg | 0.207 | 0.4 | n/a | n/a |
| Chromium | Cr | mg/kg | 9.81 | 10.5 | n/a | n/a |
| Cobalt | Co | mg/kg | 6.06 | 4.73 | 23[f] | 13 |
| Copper | Cu | mg/kg | 17.3 | 11.2 | 3130 | 15 |
| Cyanide (Total) | Cn(total) | mg/kg | 1.35 | 0.82 | 46.9 | 0.1 |
| Iron | Fe | mg/kg | 14,700 | 13,800 | 54,800 | n/a |
| Lead | Pb | mg/kg | 35.2 | 19.7 | 400 | 14 |
| Manganese | Mn | mg/kg | 1270 | 543 | 1860 | 220 |
| Mercury | Hg | mg/kg | 0.0398 | 0.1 | n/a | n/a |
| Nickel | Ni | mg/kg | 12.3 | 9.38 | 1560 | 9.7 |
| Silver | Ag | mg/kg | 0.222 | 1 | n/a | n/a |
| Thallium | Tl | mg/kg | 0.438 | 0.73 | n/a | n/a |
| Vanadium | V | mg/kg | 19 | 19.7 | n/a | n/a |
| Zinc | Zn | mg/kg | 84.8 | 60.2 | 23,500 | 48 |
| Americium-241 | Am-241 | pCi/g | 0.0993 | 0.04 | 30 | 44 |
| Cesium-137 | Cs-137 | pCi/g | 1.48 | 0.9 | 5.6 | 680 |
| Plutonium-239/240 | Pu-239/240 | pCi/g | 0.177 | 0.068 | 33 | 47 |
| Dichlorodiphenyltrichloroethane [4,4'-] | 50-29-3 | mg/kg | 0.000823 | na[g] | 17.2 | 0.044 |
| Dichlorodiphenyldichloroethane [4,4'-] | 72-55-9 | mg/kg | 0.00299 | na | 14.3 | 0.11 |
| Methyl-4-chlorophenoxypropionic(2-) acid | 93-65-2 | mg/kg | 1.32 | na | 61[f] | na |

**Table 1 (continued)**

| Analyte | Analyte Code | Units | Maximum Concentration | Canyon Sediment BVs[a] | Residential SSL[b] or SAL[c] | Minimum ESL[d] |
|---|---|---|---|---|---|---|
| 4-(2,4-Dichlorophenoxy)butyric acid | 94-82-6 | mg/kg | 0.0234 | na | 490[f] | na |
| TCDD-equivalent concentration | 1746-01-6 | mg/kg | 3.88E-07 | na | 4.50E-05 | 2.90E-07 |

[a] Sediment BVs from LANL (1998, 059730).

[b] Residential SSLs from NMED (2012, 219971), unless otherwise noted.

[c] Residential SALs from LANL (2012, 228852).

[d] Minimum ESLs from LANL (2012, 226667).

[e] n/a = Not applicable; maximum concentration less than the sediment BV.

[f] Residential SSLs from EPA regional screening table(http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[g] na = Not available.

**Table 2**
**Summary of COPECs with Maximum Detected Concentrations Greater than Minimum ESLs**

| COPECs | Maximum Concentration in 2013 (mg/kg) | Maximum Concentration in 2009[a] (mg/kg) | Canyon Sediment BV[b] (mg/kg) | Soil BV[b] (mg/kg) | Maximum Concentration in Ash (mg/kg) | Minimum ESL[c] (mg/kg) | HQ | Minimum L-ESL[c] (mg/kg) | HQ |
|---|---|---|---|---|---|---|---|---|---|
| Barium | 275 | 57.6 | 127 | 295 | 1300 | 110 | 2.5 | 260 | 1.1 |
| Copper | 17.3 | 32.6 | 11.2 | 14.7 | 45 | 15 | 1.2 | 46 | 0.4 |
| Cyanide (Total) | 1.35 | 2.21 | 0.82 | 0.5 | n/a | 0.1 | 13.5 | 1 | 1.4 |
| Lead | 35.2 | 22 | 19.7 | 22.3 | 84 | 14 | 2.5 | 28 | 1.3 |
| Manganese | 1270 | 301 | 543 | 671 | 8200 | 220 | 5.8 | 1100 | 1.2 |
| Nickel | 12.3 | 3.24 | 9.38 | 15.4 | 15 | 9.7 | 1.3 | 19 | 0.6 |
| Zinc | 84.8 | 52.7 | 60.2 | 48.8 | 180 | 48 | 1.8 | 480 | 0.2 |
| TCDD-equivalent concentration | 3.88E-07 | na[d] | n/a[e] | n/a | n/a | 2.90E-07 | 1.3 | 1.90E-06 | 0.2 |

Note: Grey shading indicates an HQ > 1.

[a] From LANL (2009, 105294).

[b] Sediment and soil BVs from LANL (1998, 059730).

[c] Minimum ESLs and L-ESLs from LANL (2012, 226667).

[d] na = Not available.

[e] n/a = Not applicable.