



Appendix 5: Sediment Management Decision Tree Guidance



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

Subject: Request for Approval of the Sediment Management Decision Tree Guidance

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the proposed Sediment Management Decision Tree Guidance for the management and disposition of sediment that has accumulated at structures installed to retain sediment in runoff from solid waste management units (SWMUs) and areas of concern (AOCs) at Los Alamos National Laboratory.

On September 9, 2016; November 4, 2016; January 18, 2017; and March 30, 2017, the U.S. Department of Energy (DOE) and Los Alamos National Security, LLC (LANS) met with representatives from the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), Surface Water Quality Bureau (SWQB), and Solid Waste Bureau (SWB) to discuss an approach for land applying sediment that has accumulated at structures installed to retain sediments in runoff from SWMUs and AOCs. After the March 2017 meeting, a final approach for the management and disposition of accumulated sediment was agreed upon by all parties represented. The enclosed document reflects this approach.

DOE/LANS request formal approval of the Sediment Management Decision Tree Guidance document. Upon NMED's approval, DOE/LANS will conduct a waste characterization and risk evaluation of sediments proposed for removal in accordance with the terms and conditions of the document. If the sediment qualifies for land application, DOE/LANS may land apply the sediments and will provide NMED with an annual report that summarizes the volume, locations, and sampling characterization results of land-applied sediments. If the sediment does not qualify for land application, DOE/LANS will provide NMED with an alternative disposition pathway for its review and approval. This decision-tree approach applies only to sediments accumulated at structures installed to retain sediments in runoff from SWMUs and AOCs.



February 22, 2022

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John Kieling and Shelly Lemon

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

Sincerely,



Bruce Robinson, Program Director
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Sincerely,



David S. Rhodes, Director
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BR/DR/SV:sm

Enclosure: One hard copy with electronic files – Sediment Management Decision Tree Guidance (EP2017-0032)

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Sediment Management Decision Tree Guidance

Prepared by the Associate Directorate for Environmental Management

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC52-06NA253 and under DOE Office of Environmental Management Contract No. DE-EM0003528, has prepared this document pursuant to the Compliance Order on Consent, signed June 24, 2016. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

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Sediment Management Decision Tree Guidance

April 2017


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Printed Name	Signature	Title	Organization	Date

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Responsible DOE-EM-LA representative:

David S. Rhodes		Office Director	Quality and Regulatory Compliance	4-21-2017
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1.0 INTRODUCTION AND APPLICABILITY

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC (LANS). LANL is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The LANL site covers approximately 39 mi² of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing ephemeral, intermittent, and perennial canyons running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level.

The New Mexico Environment Department (NMED) Compliance Order on Consent and the U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Permit No. NM30030759, Individual Permit, require structures such as detention basins, grade controls, and other in-channel erosion control best management practices to be installed in and around LANL. These structures are designed to stabilize channels and control sediment transport and storm water runoff in canyons and subdrainages downgradient of solid waste management units (SWMUs) and areas of concern (AOCs). This sediment management decision tree guidance only applies to the management of sediment accumulated at these structures and performed under Associate Directorate of Environmental Management (ADEM) programs and DOE Environmental Management Los Alamos (EM-LA) field office staff and subcontractors.

Following storm events, sediments aggregate at these erosion control structures and may require sediment removal to maintain design function. This sediment management decision tree guidance provides a logical stepwise decision-making process for LANL to follow prior to excavating sediments at these structures. The process integrates regulated waste evaluation steps required under the Resource Conservation and Recovery Act (RCRA) and risk evaluation steps similar to SWMU and AOC investigation requirements. The sediment management decision tree, shown in Figure 1.0-1, and guidance information provided as text in this document were developed in consultation with NMED. Over the course of four meetings on September 9, 2016, November 4, 2016, January 18, 2017, and March 30, 2017, DOE and LANS met with representatives from the NMED Hazardous Waste Bureau (HWB), Surface Water Quality Bureau (SWQB), Solid Waste Bureau (SWB), and Ground Water Quality Bureau (GWQB) to discuss draft versions of the decision tree and associated guidance information. After the March meeting, a final approach for the management and disposition of accumulated sediment was agreed upon by all parties and is presented below.

2.0 SEDIMENT SAMPLE COLLECTION GUIDANCE

This section is used to determine in situ sampling requirements for sediments proposed for excavation. Steps Waste Evaluation (WE) 1 and WE2 in Figure 1.0-1 correspond to the guidance information provided in this section.

2.1 Determine the Number of Sampling Locations

1. Determine the approximate surface area and depth profile of sediment proposed for excavation.
2. If the total surface area of sediment is greater than 500 ft², identify grid sampling locations approximately every 200 ft², with a minimum of six locations being identified (bias sampling locations to areas of sediment with deepest depths).

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3. If the total surface area of sediment is less than 500 ft², identify grid sampling locations approximately every 100 ft² (bias sampling locations to areas of sediment with deepest depths).

2.2 Determine the Depth Interval and Total Number of Samples at Each Grid Location

1. Determine if there is evidence of stratification of sediment layers, or if sediment is approximately homogeneous.
2. Collect samples at every grid location from a depth interval of 0 to 0.5 ft below ground surface (bgs).
3. If the deepest depth of sediment in the area proposed for excavation is 1.5 ft deep or greater, collect a minimum of two samples per sampling location.
4. If the deepest depth of sediment in the area proposed for excavation is 1.5 ft or less, and no stratification is evident, collect only one sample per sampling location.
5. If stratification is evident and thick enough to collect a representative sample, collect a sample from each stratified layer.
6. If stratification is evident but thickness is not sufficient to collect a representative sample, collect a sample through the layer, including sediment from the layers above and below.
7. If the deepest depth of sediment is greater than 3 ft and no stratification is evident, collect a sample from 0 to 0.5 ft, and collect additional samples to represent the median depth and the bottom 3 ft of sediment.

This initial determination of the number, depth, and locations of samples may be revised during sample collection based on actual site conditions.

2.3 Determine the Analytical Suite for Sampling

1. Determine the watershed draining to the area where sediment sampling will be conducted.
2. Analyze all sediments for target analyte list (TAL) metals.
3. Add any potential listed constituents as identified by the acceptable knowledge (AK)/due diligence review conducted in accordance with the latest version of procedure EPC-CP-QP-012 (supersedes WM-PROG-QP-012).
4. Evaluate relevant existing soil/sediment sampling data from previous excavations and/or upgradient soil/sediment samples from a depth of 0 to 3 ft bgs within the watershed draining to the area where sediment is proposed for removal to determine hazardous constituents to add for analysis. Add any hazardous constituent if soil/sediment sample results are greater than 10% of the applicable residential soil screening level (SSL) or screening action level (SAL).

Note: 10% of the SSL/SAL is used as a general screening guide to indicate whether a constituent is unlikely to contribute to unacceptable cumulative risk/dose and further characterization is unwarranted. SSLs are found in the NMED-HWB “Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Soil Screening Guidance for Human Health Risk Assessments” (NMED 2017, 602273, as updated). SALs are found in the LANL document “Derivation and Use of Radionuclide Screening Action Levels” (LANL 2015, 600929).

5. Evaluate the history of all SWMUs/AOCs without soil/sediment data within the watershed. Add any constituents identified as known or potentially released based on process knowledge. Additionally, include any hazardous constituent(s) potentially present based on process knowledge that was/were not included previously in analyses.

3.0 IDENTIFY CHEMICALS OF POTENTIAL CONCERN

Step WE3 in Figure 1.0-1 corresponds to the guidance information provided in this section.

The waste evaluation process and human health risk based screening evaluation are performed only on chemicals of potential concern (COPCs); therefore, it is important to correctly identify the COPCs for evaluation. COPCs are chemicals and radionuclides that may be present at concentrations different than background as a result of release(s) from SWMUs or AOCs within the drainage area upgradient of where sediments are proposed for removal. The process for identification of COPCs in sediments will follow the process described in Section 2.8.3 of NMED's "Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Soil Screening Guidance for Human Health Risk Assessments" (NMED 2017, 602273, as updated).

4.0 DETERMINE IF SEDIMENT EXHIBITS A HAZARDOUS WASTE CHARACTERISTIC

Steps WE4 and Decision (D) 1 in Figure 1.0-1 correspond to the guidance information provided in this section.

The four types of characteristic hazardous wastes, and the corresponding methods for determining if sediment exhibits a hazardous waste characteristic, are identified below [40 Code of Federal Regulation (CFR) 261.10]:

1. Ignitability (D001):
 - a. Flashpoint <math><60^{\circ}\text{C}</math> or 140°F
2. Corrosivity (D002):
 - a. pH of ≤ 2.0 or ≥ 12.5
3. Reactivity (D003):
 - a. Reacts violently when mixed with water or generates toxic gases, vapors, or fumes
 - b. Cyanide- or sulfide-bearing waste that can generate toxic gases, vapors, or fumes when exposed to pH conditions between 2.0 and 12.5
4. Toxicity (D004-D043):
 - a. Regulatory levels based on groundwater contamination scenario
 - b. Regulatory constituents (see Table 4.0-1) that meet or exceed the maximum toxic concentration limits based on the toxicity characteristic leaching procedure (TCLP) test

Based on the "characteristic" determination criteria outlined above, it is highly unlikely the sediment would be classified as a hazardous waste based on the characteristics of ignitability, corrosivity, or reactivity. However, the sediment may be hazardous based on the "toxicity" characteristic (TC). The TC determination is described in the next section.

4.1 Toxicity Characteristic Evaluation

Background

The TCLP test is designed to prevent groundwater contamination from improper waste disposal by simulating the processes that would occur in a landfill if industrial wastes are disposed of with municipal

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solid wastes. The decomposing municipal solid waste produces a slightly acidic leachate (pH 5.0) that extracts toxic constituents from the industrial waste that then migrate to groundwater. Once in the groundwater, the contaminants migrate to an underground source of drinking water.

To establish the concentration limits for the TC, EPA decided the landfill leachate would be diluted or otherwise attenuated by a factor of 100 before it reaches the drinking water source. Therefore, EPA established the TC concentration levels at 100 times the drinking water standard or other applicable health-based standards [40 CFR 261.24, Table 1]. Table 4.0-1 identifies those constituents on the “TCLP list” and their associated TC concentrations.

Note: The TCLP constituents listed in Table 4.0-1 are the only constituents where de minimis concentration levels apply when making a final hazardous waste determination.

TCLP Evaluation Steps

To determine whether sediment passes or fails the TCLP test, perform the following:

1. Obtain the analytical results from sediment samples collected per section 2.0 of this document.
2. Identify COPCs per section 3.0 of this document.
3. If results for any COPC listed in Table 4.0-1 are <20 times (20×) the regulatory levels, do not conduct the TCLP test.
4. If results for any COPC listed in Table 4.0-1 are >20 times (20×) the regulatory levels, perform the TCLP test to ensure the leachable concentration of toxic constituents is below regulatory levels.
 - a. If all TCLP results are less than regulatory levels, the sediment does not exhibit characteristic of toxicity.
 - b. If any TCLP result(s) is greater than regulatory levels, the sediment does exhibit characteristic of toxicity, and would become a characteristic hazardous waste for toxicity if excavated.

5.0 DETERMINE IF SEDIMENT CONTAINS LISTED CONSTITUENTS

Steps D2, D3, D4, D5, D7, WE5, WE6, and WE7 in Figure 1.0-1 correspond to the guidance information provided in this section.

The listed hazardous waste categories are as follows:

1. F-Listed: nonspecific sources (e.g., spent solvents from electroplating operations) [CFR 261.31; Appendix VII to Part 261—Basis for Listing Hazardous Waste]
2. K-Listed: specific sources (e.g., waste generated from the manufacture of explosives) [40 CFR 261.32; Appendix VII to Part 261—Basis for Listing Hazardous Waste]
3. U-listed: discarded commercial chemical products [40 CFR 261.33]
4. P-listed: acutely hazardous, discarded commercial chemical products (e.g., beryllium powder) [40 CFR 261.33]

The sediment would be given an F- or K-listed waste code only if a constituent listed in Appendix VII to Part 261 is a COPC in samples collected from the sediments proposed for excavation and the source of the constituent(s) is known. Compare the analytical results to Appendix VII to Part 261 to determine if

COPCs are listed in Appendix VII. If COPCs listed in Appendix VII to Part 261 are detected in the sediment, and the AK review does *not* identify a known source of the associated waste code in the upgradient watershed, then the excavated sediment does *not* need to be managed as a hazardous waste for that F- or K-listed code. However, if a known source of the COPC(s) listed in Appendix VII to Part 261 is identified in the upgradient watershed, the sediment proposed for excavation *would* need to be managed as a hazardous waste, *unless* a “contained-in” approval has been granted by the NMED-HWB.

The P- and U-listed codes are used only for pure and unused compounds. Based on the AK review, if there are known spills of an unused/unspent commercial chemical product (i.e., a P- or U-listed constituent) in the sediment, then the area of the sediment that was contaminated by the spill, if excavated, must be managed as a hazardous waste for the P- or U-listed waste code of the spilled product(s) detected in the sediment.

Note: A “contained-in” request is submitted to NMED-HWB only if there is a known source of the detected listed constituent COPC(s) in the watershed, and the detected listed constituent COPC(s) concentration in the sediment is below NMED residential SSLs and EPA land disposal restriction (LDR) treatment standards (LDR Treatment Standards for Hazardous Wastes, Non-Wastewaters, as provided in 40 CFR 268.40 and adopted by 20.4.1.800 New Mexico Administrative Code). If NMED does not have a screening value for the detected listed constituent COPC(s), then EPA Regional Screening Levels adjusted for the risk of 10^{-5} are used.

6.0 RULES AND CONDITIONS FOR LAND APPLICATION OF EXCAVATED SEDIMENT

Step RE3 in Figure 1.0-1 correspond to the guidance information provided in this section.

Sediment is qualified to be land applied if all of the following apply:

- Sediment would not be considered a hazardous or Toxic Substances Control Act (TSCA) waste,
- Sediment passes residential risk, and
- Sediment passes construction worker risk.

Excavated sediment planned for land application:

Shall be:

- Subject to restrictions identified in the LANL Project ID review and LANL Excavation Permit; and
- Stabilized in accordance with the project storm water pollution prevention plan (SWPPP), applicable project-specific work plans, the LANL Excavation Permit, and/or LANL specifications (Chapter 3, Civil Engineering).

May be:

- Mixed with native material or clean, uncontaminated fill, to backfill or restore a previously disturbed site.

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Shall not be:

- Placed within the 100-yr floodplain (or active floodplain if the 100-yr floodplain is not defined as in smaller order drainages) of arroyos, channels, and/or in gullies, water diversions, borrow ditches, or any area where storm water would be concentrated into channelized flow; or
- Placed within areas delineated as wetlands; or
- Placed within cultural site boundaries; or
- Placed in core habitat for the Mexican spotted owl during work restriction time periods; or
- Placed in buffer or core habitat for the Jemez Mountains salamander [core and buffer areas are defined in the LANL “Threatened and Endangered Species Habitat Management Plan for Los Alamos National Laboratory” (Hathcock 2015, 602156)]; or
- Placed on wet, snow-covered, or frozen ground; or
- Placed during periods of precipitation; or
- Placed with free liquid water; or
- Placed such that ponding of water occurs on the sediment.

Any sediments planned to be placed off of DOE/LANL property must have written permission from the land owner prior to placement of sediments.

Annually, LANL will submit a summary report to NMED of all land applied sediment subject to this process. The report will include:

- In situ sampling analytical suite and results including a map with sampling locations,
- Regulated waste evaluation results,
- Risk evaluation results,
- Figure showing the location, volume, and depth of sediment land applied, and
- Stabilization measures performed.

7.0 NOTIFICATION OF UNACCEPTABLE RISK

Steps D6, RE1, and RE2 in Figure 1.0-1 correspond to the guidance information provided in this section.

In the event that results from the human health risk based screening evaluation indicate that the sediment would pose an unacceptable risk under the residential or construction worker scenarios, LANL will notify NMED-HWB, NMED-SWQB, and NMED-GWQB by email. The email will include the following:

- In situ sampling analytical suite and results including a map with sampling locations,
- Regulated waste evaluation results,
- Risk evaluation results, and
- Proposed sediment management activities (if any).

Following the email notification, it may be necessary for NMED and LANL to discuss future actions regarding the sediment.

8.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID or ESHID. This information is also included in text citations. ERIDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESHIDs 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.

Hathcock, C., October 2015. "Threatened and Endangered Species Habitat Management Plan for Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-15-28610, Los Alamos, New Mexico. (Hathcock 2015, 602156)

LANL (Los Alamos National Laboratory), September 2015. "Derivation and Use of Radionuclide Screening Action Levels, Revision 4," Los Alamos National Laboratory document LA-UR-15-24859, Los Alamos, New Mexico. (LANL 2015, 600929)

NMED (New Mexico Environment Department), March 2017. "Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Soil Screening Guidance for Human Health Risk Assessments," Hazardous Waste Bureau and Ground Water Quality Bureau, Santa Fe, New Mexico. (NMED 2017, 602273)

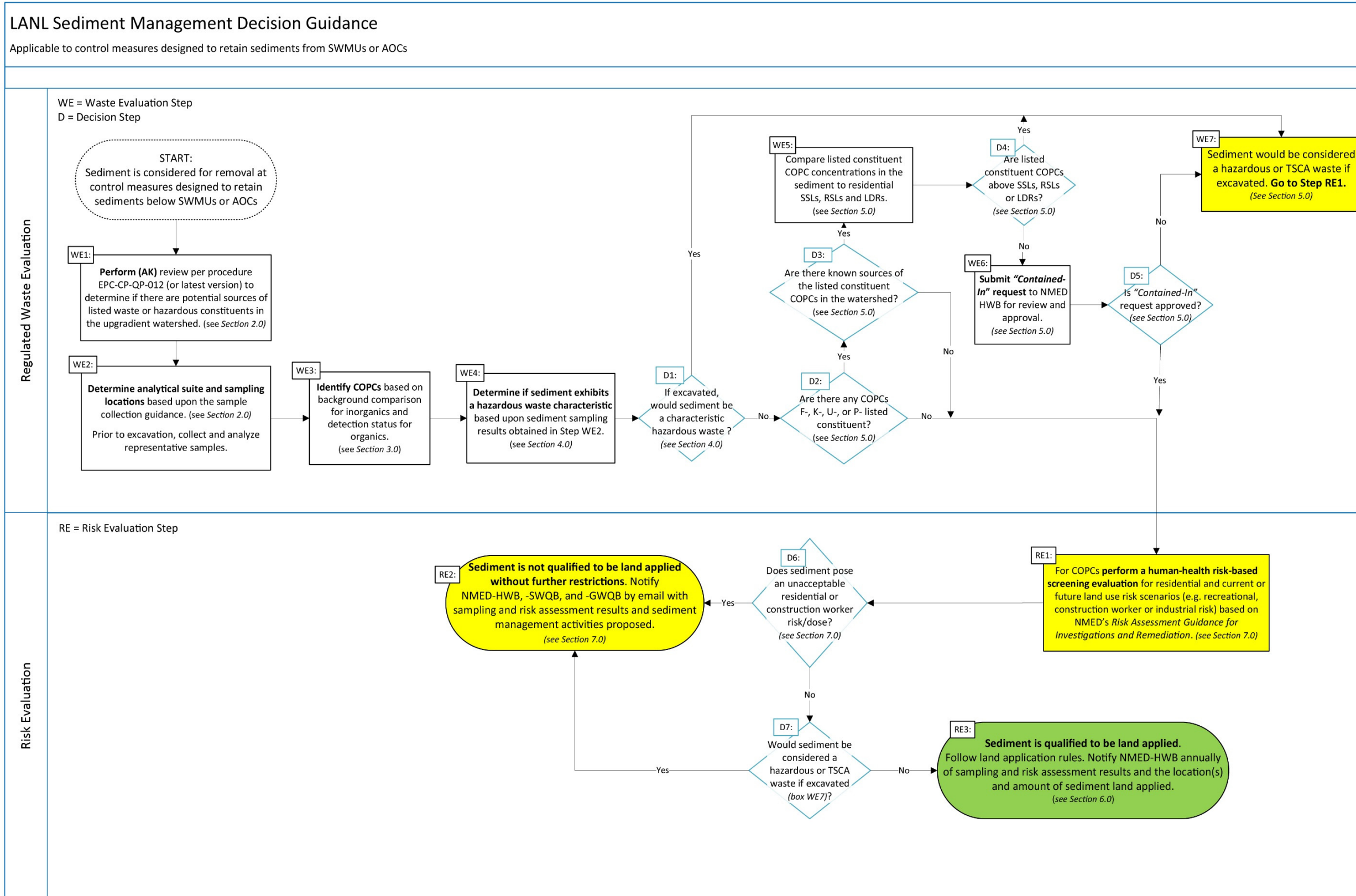


Figure 1.0-1 Sediment management decision tree

Table 4.0-1
Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA Hazardous Waste Code	Contaminant	Regulatory Level (mg/L or ppm)
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon Tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol	200.0
D024	m-Cresol	200.0
D025	p-Cresol	200.0
D026	Cresol	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichlorethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorbutadiene	0.5
D034	Hexachlorethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachlorethylene	0.7
D015	Toxaphene	0.5
D040	Trichlorethylene	0.5

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Table 4.0-1 (continued)

EPA Hazardous Waste Code	Contaminant	Regulated Level (mg/L or ppm)
D041	2,4, 5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl Chloride	2.0