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Environment & Remediation Support Services

Standard Operating Procedure

for GEOMORPHIC CHARACTERIZATION

APPROVAL SIGNATURES:

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1.0 PURPOSE AND SCOPE

The purpose of this procedure is to describe the process for conducting geomorphic characterization of potentially-contaminated sediments for the Los Alamos National Laboratory (LANL or Laboratory) Environment & Remediation Support Services (ERSS).

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

This procedure is not intended to provide complete training for conducting geomorphic characterization activities for the ERSS Division. It is intended to be used as a guide for adequately characterizing potentially contaminated sediment deposits by personnel with sufficient field experience in geomorphic characterization activities.

2.2 Precautions

This procedure is to be used in conjunction with an approved Site-Specific Health and Safety Plan (SSHASP). Consult the SSHASP for information on and use of all PPE.

3.0 EQUIPMENT AND TOOLS

• Field Notebook	• Compass
• Base Map(s)	• Pruning Shears
• Tape Measures	• Ruler
• Shovels	• Wooden Stakes
• Soil Knife	• Clip Board
• Pin Flags	• Rock Hammer
• Flagging Tape	• Sharpie

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Activities Required Prior to Issuing a Contract for Geophysical Logging

Field Team Leader	1.	Prepare a geomorphic map of the area under investigation at a scale and level of detail appropriate to both the field setting and to the goals of the investigation. [NOTE: A map scale of 1:200 (1 cm = 2 m) has been found to be adequate to map geomorphic units in the narrowest canyon bottoms. Smaller map scales may be suitable for wider canyon bottoms. The smallest scale that has been useful in canyons is 1:1200 (1 cm = 12 m), which is the original scale of 1991 orthophotos prepared for the ERSS Division.]

Field Team Leader (Continued)	2.	Establish a series of surveyed control points in the study area for use as local references. [NOTE: The standard FIMAD topographic maps with 2-foot contour intervals often do not adequately depict the location and orientation of stream channels in narrow, forested canyon bottoms at the Laboratory, and these topographic maps cannot be consistently relied on to provide sufficient accuracy.]
	3.	Define major geomorphic units in the investigation area, and delineate their boundaries in the field on a base map. [NOTE: The standard nomenclature that has been used in canyons investigations includes the initial designation "c" for post-1942 channel units (both active and abandoned channels), "f" for post-1942 floodplain units (areas impacted by flooding but not occupied by the main channel since 1942), and "Q" (Quaternary) for pre-1942 geomorphic units. The "c" and "f" units are followed by numeric designators. For channel units, "c1" represents the active channel, "c2" represents the youngest abandoned channel unit, and so on. The "f1" indicates areas that have been inundated by post-1942 floods, but have not been occupied by the main channel during this period, and "f2" indicates areas that may have been impacted by post-1942 floods, but for which evidence is less certain. Subunits can also be broken out as appropriate (e.g., "c2a", c2b"). Units can be differentiated based on either physical characteristics (e.g., height above channel, type and/or age of vegetation) or on contaminant characteristics (e.g., relative levels or radiation, as measured with field instruments). Map units should be delineated consistently within the map area, although the map units may vary between different parts of a canyon due to varying geomorphic conditions. One major goal of the map is to allow areas to be calculated for each geomorphic unit. Combined with measurements of sediment thickness, these allow sediment volumes to be calculated. Combined with measurements of contaminant concentrations, the volume estimates in turn allow estimation of contaminant inventories. The measured areas of the different units can also be incorporated into risk assessments and can be used in evaluating remedial alternatives.]
	4.	Revise the geomorphic map, as needed, based on new field information or analytical results, or as the conceptual model of the site evolves. [NOTE: Geomorphic unit designations and boundaries of units may be subject to change as an investigation proceeds, as new information is obtained, and as the conceptual model of the site evolves. These changes to geomorphic designations are based on the judgment of the field mapper, and it is not necessary to formally document the reason for each change. However, each geomorphic map should indicate the date of the latest revision to avoid use of obsolete map versions. Each geomorphic map should also include the name of the mapper.]
	5.	Describe the characteristics of each geomorphic unit in the map area.
	6.	Evaluate the nature and thickness of post-1942 sediment deposits in each geomorphic unit.

Field Team Leader (Continued)	7.	Examine sediment deposits in each geomorphic unit at a series of locations within the area of investigation, either at stream bank exposures or in hand-dug holes.
	8.	Because sediment characteristics vary laterally within each unit, examine a sufficient number of locations to incorporate this natural variation, with the number of locations determined in the field based on the professional judgment of the Lead Geomorphologist.
	9.	Estimate the thickness of post-1942 sediment at each location, including the presence of buried soils or exotic materials, the depth of burial of trees, field radiological measurements, or contaminant levels as determined from analytical measurements of sediment samples.
	10.	Give particular attention to the thickness of fine-grained sediment at each site because contaminant concentrations generally increase with decreasing particle size, and the highest concentrations and largest inventory are generally found in fine-grained sediments. [NOTE: Field estimates of median particle size in the > 2mm size fraction are initially used to differentiate fine-grained vs. coarse-grained sediment, with sediment with a medium particle size of medium sand being used as an approximate boundary between these two sediment facies. Laboratory particle size analyses can be used to refine field estimates, as appropriate.]
	11.	Record field notes on the stratigraphy at each location, which are used to determine average thicknesses for the purpose of calculating sediment volumes and to help select representative sample locations.
	12.	Capture summary data on thicknesses within each unit in a final report. [NOTE: It is not necessary to formally document the detailed stratigraphy at each site.]
	13.	Obtain additional geomorphic information for map units, as appropriate, based on the objectives of the investigation and the specific field setting (e.g., information on the age of specific units can be obtained from an examination of sequential aerial photographs or by tree-ring dating).
	14.	Prepare a Geomorphic Characterization Report that includes one or more geomorphic maps of the area under investigation, descriptions of each geomorphic unit on the map(s), and supplemental information on the geomorphology of the investigation area as considered appropriate. [NOTE: The report may either be restricted to the geomorphic characterization activities or may be a more comprehensive investigation of the site in which the geomorphic characterization is one of several components.]

4.2 Records

Field Team Leader	1.	Submit the following records generated by this procedure to the Records Processing Facility: • Geomorphic Characterization Report.

5.0 PROCESS FLOW CHART

Flow chart is to be included at a later date.

6.0 ATTACHMENTS

None.

7.0 REVISION HISTORY

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Revision No. *[Enter current revision number, beginning with Rev.0]*	Effective Date *[DCC inserts effective date for revision]*	Description of Changes *[List specific changes made since the previous revision]*	Type of Change *[Technical (T) or Editorial (E)]*
0.0	02/09/07	Reformatted and renumbered, supersedes SOP-03.08	E

Using a CRYPTOCard, click here to record "self-study" training to this procedure.

If you do not possess a CRYPTOCard or encounter problems, contact the ERSS training specialist.