Quality Assurance Project Plan

Lower Kittitas Reach Floodplain Reconnection Project Geotechnical Investigation

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WA Ecology Office of Columbia River Grant Agreement WROCR-2123-KiCPWD-00032

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1.0 Background and Project Description

Background

Kittitas County is utilizing Department of Ecology funding to collect preliminary geotechnical and geological information for the purposes of advancing the Lower Kittitas Reach Floodplain Reconnection Project (Restoration Project). The Restoration Project is currently at the Conceptual Phase (15% design level) and was developed in partnership between Kittitas County (County) and the Bureau of Reclamation (Reclamation) (USBR and Kittitas County, 2024). The Restoration Project intent is to reconnect floodplain habitat along the Yakima River within the Lower Kittitas Reach in Kittitas County, Washington State.

The Restoration Project Area lies within the lower half of the Kittitas Reach of the Yakima River, which is one of several broad Yakima River floodplain valleys (Figure 1). These broad valleys historically consisted of large floodplains that were well connected to the river. With sediment loads and large wood inputs associated with snow melt dominated flood flows, frequent dynamic channel switching (i.e., avulsion) processes would occur (Stanford et al. 2002). Yakima River hydrology is managed with several storage reservoirs upstream. As a result, flood magnitude and sediment inputs have been significantly reduced from historic conditions, reducing channel migration and avulsion frequency (WSE 2021). This management approach has also reduced inputs and storage of large wood, an important element in sustaining a thriving and resilient floodplain habitat mosaic. A uniquely managed hydrologic regime through this reach known as “flip-flop” provides irrigation water to downstream diversions at high flow rates for an extended period during summer months. This regime along with reduced sediment and large wood inputs impact otherwise naturally occurring riparian habitat development processes and reduces juvenile salmonid rearing habitat due to water velocities exceeding the swimming abilities of the young fish (WSE and Herrera 2015).

Flood barriers protecting public and private property for agricultural, residential, and gravel mining purposes have heavily impacted the Project area (Figure 2). The Hansen Pits levee exists along the north end of the Project and a private berm connects to and extends downstream from this levee. Combined, the levee and berm have disconnected more than 3,000 feet of main and side channel from the historic floodplain of the Yakima River. Though these structures have been failing and currently allow low velocity floodwater into the previously protected areas, they continue to maintain a barrier between the river and its floodplain. Several large ponds known as the Hansen Pits located at the north end of the Restoration Project are the result of a former gravel mining operation. One of the ponds, immediately behind the Hansen Pits levee, is already connected to the river due channel migration through a portion of the levee.

The conceptual design features will be informed by the preliminary geotechnical and geological investigation: excavation and removal of existing levees and berms, flood mitigation feature (road elevation, set-back berm) construction, partial fill of Hansen Pits with locally excavated materials, and floodplain recontouring to elevations suitable for floodplain connection and riparian forest establishment.

Preliminary Geotechnical and Geological Investigation Goals

The goal of preliminary geotechnical and geological investigation is to advance the restoration design. Geotechnical information is typically collected for these types of restoration projects and will inform: the suitability of utilizing materials located on site for flood berm, fill pad, and gravel pit fill and whether the setback flood control berm design will need to account for subsurface water flows.

Preliminary Geotechnical and Geological Investigation Objectives

This project will evaluate shallow soil and soil moisture conditions at 27 locations throughout the site. The data generated will be used to develop preliminary geotechnical recommendations for site design and construction, which will be considered by the restoration design engineers preparing 30% design documents and specifications. These recommendations will include project earthwork including whether materials encountered in the test pits are suitable for re-use as fill for the project. This will include fills to create new dikes/berms and filling of the ponds. The data may also identify areas of unsuitable materials that could affect project design. General information about shallow groundwater depths across the site during the normally dry season, when site construction will likely occur, will also be obtained.

Preliminary Geotechnical and Geological Investigation Boundaries, Constraints, and Limitations

The investigation boundaries include property owned by Kittitas County and the U.S. Bureau of Reclamation within the Restoration Project Area. This property ownership corresponds to the locations where the conceptual design features previously identified as pertinent to the collection of preliminary geotechnical and geologic information are located. Underground utilities could prevent the completion of some of the proposed test pits, including a known gas line which is located at the site. The water elevation of groundwater-fed ponds throughout the project area, indicates that high groundwater conditions could also limit the depth of test pits.

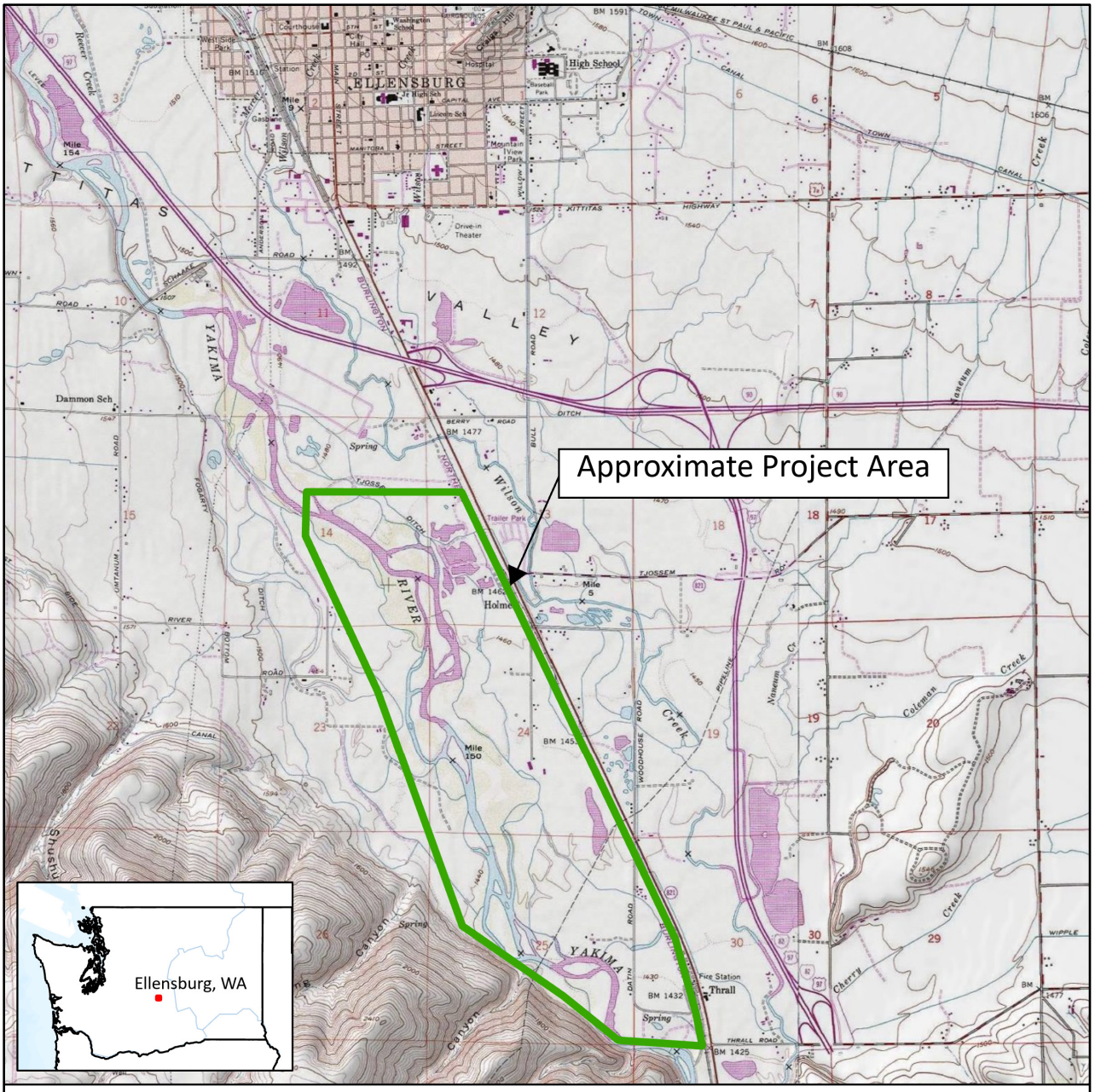
Approximate Project Area
Ellensburg, WA
NAD 1983 (2011) StatePlane
Washington South FIPS 4602
Vertical Datum - NAVD88
US Survey Feet
0 0.25 0.5 1 Miles
N

Figure 1. Map of Larger Study Area

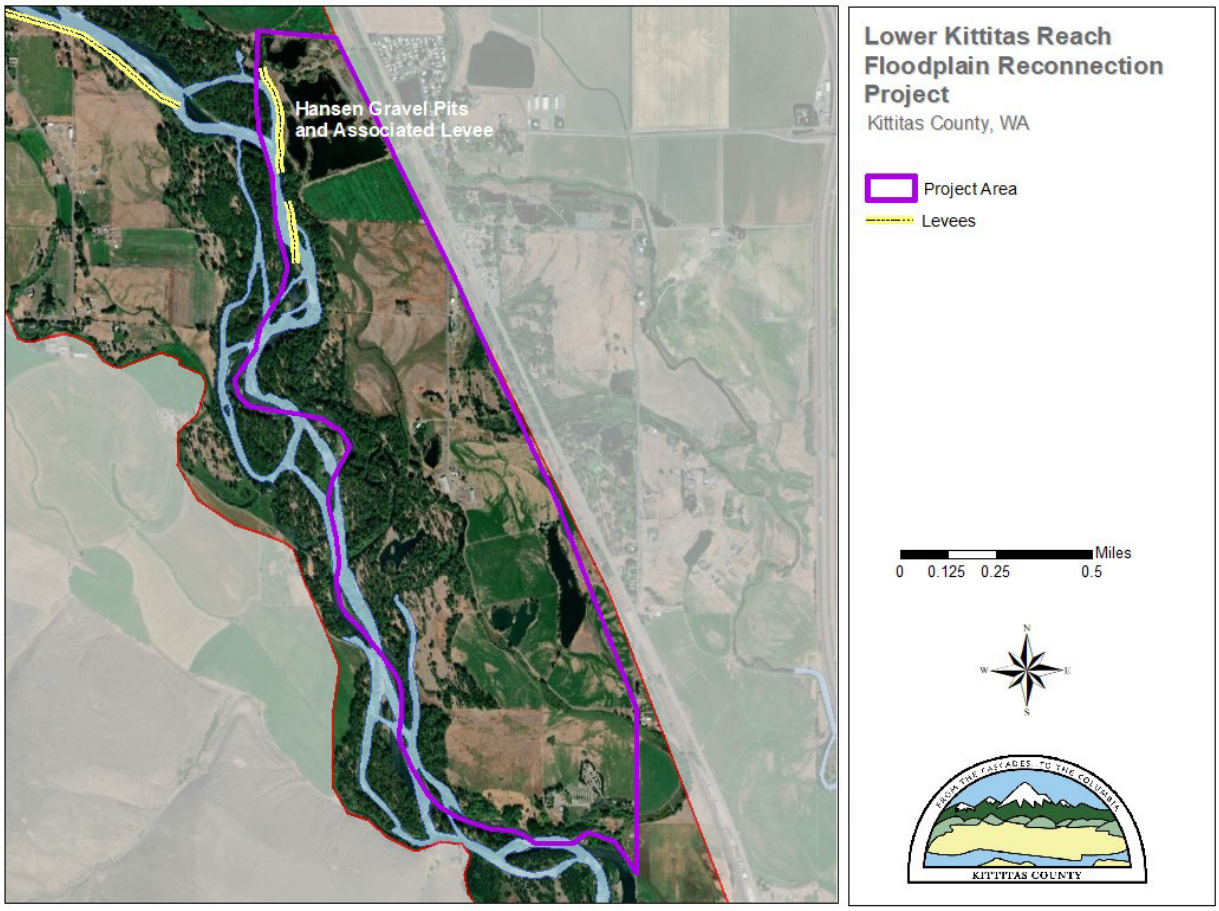

Figure 2: Project Area Map showing location of major levee features and gravel pits**.**

2.0 Organization and Schedule

The following project staff will implement the study and have the following roles and responsibilities:

Table 1: Project Staff

Project Staff	Organization and Title	Roles and Responsibilities
Kevin Haydon 509-823-6947 keha461@ecy.wa.gov	Department of Ecology YBIP Project Manager | Environmental Planner	Office of Columbia River Project Manager Review draft QAPP and report and recommend for approval.
Scott Tarbutton, LG, LHG 509-329-3539 scott.tarbutton@ecy.wa.gov	Department of Ecology Hydrogeologist	Office of Columbia River Quality Assurance Coordinator. Review draft QAPP and report and approve the final QAPP and report.

Arden Thomas 509-962-7690 arden.thomas@co.kittitas.wa.us	Kittitas County Water Resource Manager	As the Kittitas County Project Manager, Arden approves the final scope for Geo-Engineers, ensures that all cultural resources clearances have been obtained before work occurs, approves expenditures, and is responsible for grant reporting. Arden has nearly 20 years of project management experience and is proficient in stakeholder relations, permitting, grant and budget management, contracting and floodplain management.
Steve Helvey, LG, LEG, LHG 253-831-2613 shelvey@geoengineers.com	GeoEngineers Project Manager Senior Hydrogeologist / Engineering Geologist	Principal Investigator and Geotechnical Investigation Project Manager. Steve will coordinate all subcontractors (e.g., utility locate), oversee the field sampling and transportation of samples to the laboratory. Conducts QA review of data, analyzes and interprets data. Writes the draft report and final report. Steve has approximately 30 years of experience completing similar studies in other areas. He manages a geotechnical on-call contract with Kittitas County.
Patrick Sumner, GIT 774-487-1185 psumner@geoengineers.com	GeoEngineers Field Assistant.	Patrick will collect samples and record field information. Patrick is a field geologist/hydrogeologist with GeoEngineers and is currently working on the Whiskey Siphon project for the County.
Jory Strickland 425-861-6043 jstrickland@geoengineers.com	GeoEngineers Laboratory Manager	Jory Strickland, Jory has more than 5 years of experience and manages the GeoEngineers Redmond laboratory. He

		ensures that all soil tests are completed in accordance with applicable specifications and manages internal compliance with corporate QA/QC best practices.

Project Schedule

The project schedule is shown in Table 2. Fieldwork is currently scheduled for October 21-25, 2024. Coordinating cultural resource monitoring and the Ecology QAPP review process may delay this schedule. In any case, test pit construction and data collection will occur before December 1, 2024 to ensure the work occurs before the ground freezes. Should fieldwork be delayed, the rest of the project schedule will be adjusted accordingly.

Table 2: Project Schedule

Date	Activity
October 11, 2024	Reconnaissance visit and utility locate marking visit
October 14, 2024	Pre-field exploration project briefing
October 21, 2024 - October 25, 2024	Field investigation
November 8, 2024	Date by which laboratory analysis is expected to occur
November 29, 2024	Draft Report
December 31, 2024	Final Report
February 28, 2024	Data Entry into EIM

3.0 Quality Objectives

The objectives of the project are to understand shallow geologic and hydrogeologic conditions across the site for the purposes of informing restoration design (currently at the conceptual design phase). This is similar to the "Project Definition Phase" in the 2022 WSDOT GDM (Section 1.1.1). The project objectives will be accomplished by observing soils exposed in test pit explorations and the results of index testing of disturbed soil samples collected from the pits. These data will indicate whether the soil can be excavated and used as fill in various project applications, whether soils in certain parts of the site are better suited for fill materials and whether the in-place soil permeabilities could allow for soil piping. Quality objectives will be met by ensuring data collection conforms to Soil Classification System (USCS) and ASTM International (ASTM) D 2488 standards.

The Washington Department of Transportation has established specific standards for Quality Control (checking for errors, omissions, and making sure that the project elements work together coherently), and Quality Assurance (third party assessment the effectiveness of the QC program and the quality, completeness, accuracy, and precision of the work being performed, and that it is consistent with design standards) (WSDOT GDM Manual 2022). These standards

ensure that geotechnical data collection meets quality objectives for construction projects and is adopted to ensure the quality and usefulness of the data generated, as the proposed data collection is also for a construction project. Data collection and analysis follows the procedures and protocols identified by WSDOT (2022).

4.0 Study Design

The project study boundary is shown in Figures 1 and 2. An initial identification of geotechnical test pit location is shown in Figure 2. The actual location of each test pit may be adjusted on site, in response to access or underground utility information and/or site access limitations.

Timothy DeWeese, P.E., Bureau of Reclamation civil and water resource engineer and Christopher Cuhaciyan, PhD., P.E., Bureau of Reclamation Hydraulic Engineer identified that 27 test pit locations would be appropriate for a project of this size and this design phase (T. DeWeese and C. Cuhaciyan, December 12, 2023). These engineers provided an initial identification of the spatial distribution of test pits, targeting areas appropriate to characterize due to either 1) the presence of potential source fill for gravel pond or flood mitigation features (berm and fill pad) or 2) the location is associated with a set-back berm. The Natural Resources Conservation Association soil survey map also informed the spatial distribution of test pit locations.

The geotechnical study will be conducted in general accordance with guidelines provided in the Washington State Department of Transportation Geotechnical Design Manual (2022).

The following tasks will be conducted:

- Complete 27 shallow (test pit) explorations throughout the site. The test pits will be completed to depths of up to 10 feet each.
- Document soil and groundwater conditions within the test pits. Explorations will be backfilled the same day they are excavated.
- Obtain soil samples at each test pit location.
- Select soil samples collected from the pits will be submitted to the soils laboratory for analyses. The analyses will be grain size distribution and moisture content testing. The laboratory analyses will be conducted at the GeoEngineers Redmond Soils Laboratory to establish grain size distributions of collected samples.
- Use the field and laboratory data to evaluate shallow soil and soil moisture conditions throughout the site at the time the test pits are completed.
- Develop and provide preliminary geologic and geotechnical recommendations for project design.

Figure 3. Proposed Explorations Map

5.0 Field Procedures

First a geologic site reconnaissance visit will occur. During this site reconnaissance visit, access to proposed exploration locations will be evaluated. Some exploration locations may be adjusted based on access conditions/constraints. Each of the exploration locations will be marked by placing a white painted stake and painting a rectangular box at each location. If any exploration locations are adjusted in the field, the new locations will be recorded on the map. A GPS coordinate map will also be generated in the field. After the sites have been marked, the "One Call" State Utility Notification System will be called to check for buried utilities in the areas of the proposed exploration locations. Additionally, the services of a private locating company will be obtained to clear the proposed exploration locations with respect to privately owned utilities. All utility locations will take place prior to initiation of test pit explorations. GeoEngineers field staff will accompany the private utility locating company to each exploration location.

A pre-field exploration project briefing will occur at least a week before the field investigation. The briefing will include preparation of a field briefing checklist, project specific Job Hazard Analyses, project goals, challenges and plans, and lay out start times and expectations for subcontractors.

A backhoe operator will complete the test pit explorations. The test pits will be completed, on average, to depths of up to 10 feet each utilizing a backhoe. We expect the test pits to readily cave at this depth or shallower, based on soil type and groundwater depths. Test pits will be terminated when caving prevents advancement of the test pits to deeper depths or presents a safety hazard to on-site personnel and/or nearby utilities. GeoEngineers Field Assistant will record and describe soils encountered in each test pit in general accordance with the Unified Soil Classification System (USCS), ASTM International (ASTM) D 2488. Observations will be documented on test pit logs. Up to three bulk disturbed soil samples will be collected from each test pit. The number of expected disturbed samples is based on experience with similar sites and similar alluvial soils. It is unlikely that more than three different types of soil will be exposed in each test pit. Fewer than three disturbed samples will be collected if fewer than three soil types are encountered in an individual test pit. The disturbed samples will be collected from the backhoe bucket and placed in Ziplock plastic bags, in accordance with the WSDOT GDM manual (page 3-8). Each test pit will be backfilled with excavated soil.

A field log will record irreplaceable information, such as:

- Name and location of project
- Field personnel
- Sequence of events
- Outside personnel names and arrival/departure times if any arrive in work area.
- Environmental conditions
- Date, time, location, ID, and description of each sample (this will be included in the test pit logs, not the daily log)

- Completion of a hand-written daily field report using the GeoEngineers field report template.

Blank copies of the test pit log and field report forms are included in Appendix A.

The Field Assistant will visually classify the various soil types and depth to contacts between soil types in each exploration. Classifications will be completed in accordance with the Unified Soil Classification System (USCS). American Society for Testing and Materials (ASTM) D 2488. A sheet describing these methods is included in Appendix B. Depth to shallow groundwater, if observed, will be measured using a metal tape measure. The field assistant will collect samples by placing them in labeled plastic zip lock bags in accordance with the GDM manual to maintain approximate natural moisture contents. The field assistant will record observations in daily field reports and test pit log forms on the project SharePoint site, which will be stored within the project SharePoint site. The field assistant will also record observations on standard GeoEngineers test pit log forms.

The Project Manager/Principal Investigator will review the disturbed soil samples and the field exploration logs in our Redmond Laboratory. The PM/PI will select soil samples and the soil tests to be run on the soil samples. These decisions will be made based on soil sample composition, soil sample moisture, soil sample position within the test pit and test pit location. Selected disturbed soil samples will be tested in our Redmond, Washington laboratory for grain size distribution, hydrometer testing, moisture content and percent organics if a large percentage of organic material appears present in the soil sample(s).

Neither the field sampling nor access to the sites necessitates in-water work or crossings that risk potential aquatic invasive species contamination. Terrestrial invasive species contamination is not deemed to be a concern. There are currently several weedy species on site, which are widespread and common throughout Washington State. Machinery and equipment will generally be clean of potential weed sources and will not pose a larger risk than currently existing on site. The Kittitas County Weed Control Board will be consulted to assist with monitoring and addressing noxious weeds deemed by the Board to require treatment.

Fire risk is an important site consideration. The combination of dry, un-mowed vegetation, low relative humidity and hot catalytic converters can cause fires. Given this risk, work will occur after Labor Day, when evening temperatures drop and relative humidity increases and fire risk decreases.

6.0 Quality Control

The GeoEngineers Project Manager/Principal Investigator will then select the appropriate field staff and thoroughly brief them at least a week before they depart for the site. The briefing will include preparation of a field briefing checklist and project specific Job Hazard Analyses. Our meeting will discuss the project goals, challenges and plans. It will lay out start times and expectations for our subcontractors.

Daily field reports and field (preliminary) test pit log forms will be stored within the project SharePoint site. All documents will be reviewed by the GeoEngineers Project Manager. They will be posted to our SharePoint site within 24 hours of composition. The field test pit log forms are preliminary documents. Final test pit logs will be posted after the laboratory testing program is completed.

The Project Manager will review the field test pit logs and the disturbed soil samples in our Redmond Laboratory. He will check that the soil sample labels match what is recorded in the test pit log forms and will review the soil samples vs the soil sample classifications noted in the field. As previously identified, soil classifications will be completed in accordance with ASTM (American Society for Testing and Materials) standards. The number of soil samples analyzed will be in general accordance with Section 5.6.2 of the WSDOT GDM. Final logs will be completed after the visual examination by the PM/PI and laboratory testing program are completed.

The Laboratory Manager will maintain quality assurances as described in the laboratory QAPP (Appendix C). The PM/PI will review the data for accuracy.

Other quality control procedures will follow the specification identified in Section 5.6.1 of the Geotechnical Design Manual, Washington State Depart of Transportation, Materials Laboratory, Engineering and Regional Operations (WSDOT 2022) and the GeoEngineers Redmond Soils Laboratory Quality Assurance Plan (Geoengineers 2022).

6.1 Steps in preparation of field work

The only data collection equipment required in the field is a steel measuring tape and iPad. The iPad will be used to record test pit locations on a map using the GPS capabilities of the iPad. The measuring tape will be used to measure depths to groundwater and various soil contacts in the test pits. The iPad will be fully charged prior to arrival for field work.

6.2 Steps taken in field

The Field Assistant will collect up to three disturbed soil samples per test pit. These samples will be from distinct layers exposed in the test pit. Our representative will also measure the depth to various layer contacts using a steel measuring tape. Samples will be collected from the trackhoe bucket (GDM Manual, Chapter 15, Page 15.10) as field staff cannot enter a test pit exploration for safety purposes (WSDOT GDM Manual). Samples will be placed in ziplock plastic bags that contain labels describing the test pit number, sample depth and sample number.

The quality measurement objectives do not warrant the collection of duplicate samples, as reflected by standard practices for this type of geotechnical investigation. Observed soil type variability will addressed by collecting separate samples to characterize this variability, as determined as appropriate by the Principal Investigator and Geotechnical Investigation Project Manager and Field Assistant. Soil characterization is more general than the measurement error

associated with grain size analysis. The laboratory has their own practices and standards for equipment calibration (Appendix C).

The test pits will be backfilled soon after excavation, before groundwater levels stabilize. This will be done for safety purposes as it is not a safe practice to leave test pits open on a project site.

7.0 Data Management Procedures

The Field Assistant will complete the field forms (Appendix A) and then upload the completed forms to the GeoEngineers project SharePoint site. These forms are then reviewed by the GeoEngineers Project Manager/Principal Investigator. The Project Manager/Principal Investigator also review the logs and the samples when they come in. Field soil classifications are preliminary and subject to validation by laboratory analysis.

Data management procedures for laboratory results are addressed in Appendix C, Section 5.9 Records Retention.

Study data, including grain size data, moisture content, and observed depth to groundwater, will be uploaded to Ecology's Environmental Information Management (EIM) database under Study ID: WOCR2123KiCPWD00032. No chemical analytical tests will be completed, and groundwater depth measurements will be general in nature.

8.0 Reporting and Field Activity Assessments

Daily field reports will be completed during the project. These field reports will describe field activities, the time events occurred and field observations. These documents can be made available if needed.

The field and laboratory data will be analyzed by the GeoEngineers Project Manager/Principal Investigator. The geotechnical evaluation will address whether consistent soil conditions exist across the site, or whether certain areas contain soils suitable for re-use as fill while other areas may not. Maps displaying this information will be produced. Recommendations will be provided for earthwork procedures including methods to backfill the site ponds. A range of permeability estimates for site soils based on the grain-size and hydrometer testing will be developed. This will inform opinions about the possibility of soil piping in proposed dike areas.

Data and conclusions/recommendations will be summarized in a technical report for the project. The report will contain supporting field and laboratory data.

9.0 References

Ecology, 2000. Quality Management Plan. Washington State Department of Ecology, Olympia, WA. Publication No. 00-03-012. www.ecy.wa.gov/biblio/0003012.html

Ecology, 2004. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies, Washington State Department of Ecology, Publication No. 04-03-030). https://fortress.wa.gov/ecy/publications/summarypages/0403030.html

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Stanford et al. 2002. The Reaches Project. Project No. 1997-04700, 152 electronic pages, (BPA Report DOE/BP-00005854-1)

T. DeWeese and C. Cuhaciyan, December 12, 2023. Regularly scheduled bi-monthly Lower Kittitas Reach Floodplain Reconnection Project design team meeting.

USGS, 2003. Techniques of Water Resources Investigations Reports. U.S. Geological Survey, U.S. Government Printing Office. https://pubs.usgs.gov/wdr/WDR-WA-03-1/pdf/ADR_O.pdf. Links to descriptions of the procedures listed are available at: https://pubs.usgs.gov/twri/index090905.html.

WSDOT, 2022. Geotechnical Design Manual, Washington State Depart of Transportation, Materials Laboratory, Engineering and Regional Operations, February 10, 2022. https://www.wsdot.wa.gov/publications/manuals/fulltext/M46-03/Geotech.pdf

WSE 2021. Hansen Pits Channel Migration and Avulsion Risk Assessment. Watershed Science and Engineering, Seattle Washington. Prepared for Kittitas County Department of Public Works, Ellensburg, Washington.

WSE and Herrera 2015. Corridor Plan: Yakima River Jeffries Levee to Yakima Canyon Habitat Enhancement and Flood Risk Management Plan. Watershed Science and Engineering, Seattle Washington; Herrera Environmental Consultants, Seattle Washington. Prepared for Kittitas County Flood Control Zone District, Ellensburg, Washington.

10.0 Appendices

Appendix A Blank Field Report and Test Pit Logs

GEOENGINEERS

Street
City State Zip
Phone

Field Report

	Project:		File Number:
			Date:
	Owner:	Time of Arrival:	Report Number:
Prepared by:	Location:	Time of Departure:	Page:
Purpose of visit:	Weather:	Travel Time:	Permit Number:

Upon arrival to the site I assessed personal safety hazards: ☐ Yes or ☐ Referred to Site Safety Plan and Safety Tailgate if applicable

Safety Hazards Were Addressed by : ☐ Staying Alert to Construction and Equipment Hazards ☐ Other (describe)

☐ **THIS FIELD REPORT IS PRELIMINARY**

A preliminary report is provided solely as evidence that field observation was performed. Observations and/or conclusions and/or recommendations conveyed in the final report may vary from and shall take precedence over those indicated in a preliminary report.

FIELD REPRESENTATIVE **DATE**

☐ **THIS FIELD REPORT IS FINAL**

A final report is an instrument of professional service. Any conclusions drawn from this report should be discussed with and evaluated by the professional involved.

REVIEWED BY **DATE**

Attachments:

Distribution:

LOG OF TEST PIT _____

Approximate ground surface elevation: _____ feet

Project _____ Date _____ Hour _____ Logged By _____

Location _____ Equipment _____ Job No. _____

Sample No.	Sample	Depth (Feet)	Group Symbol	SOIL DESCRIPTION	OTHER TESTS AND NOTES
		0			
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			

Test pit completed at _____ feet on _____.

_____ Groundwater seepage observed at _____ feet.

_____ Caving observed at _____ feet.

Disturbed soil samples obtained at _____ feet.

Remarks

_____

_____

_____

_____

_____

Appendix B GeoEngineers Exploration Log Key

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- Modified California Sampler (6-inch sleeve) or Dames & Moore
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

- Measured groundwater level in exploration, well, or piezometer
- Measured free product in well or piezometer

Graphic Log Contact

- Distinct contact between soil strata
- Approximate contact between soil strata

Material Description Contact

- Contact between geologic units
- Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Rev. 03/2024

Appendix C GeoEngineers Laboratory QAPP

Laboratory Quality Assurance Plan

GeoEngineers Redmond Soils Laboratory
Redmond, Washington

for

July 14, 2024

17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425.861.6000

GeoEngineers

Laboratory Quality Assurance Plan (LQAP)

GeoEngineers Redmond Soils Laboratory
Redmond, Washington

Revision No. 5
July 14, 2024

Approved by:

_____

Laboratory Manager

_____

Puget Sound Geotechnical Group Leader

GeoEngineers

Record of Revisions

REVISION #	PAGE	SECTION	DESCRIPTION OF CHANGE
-0-	All	All	Submitted for AASHTO Accreditation
1	5	Organization	Added new lab staff to tree chart
2	11	Subcontracting	Updated this section per AASHTO Audit
3	A,B	Tests	Removed/added testing for program
4	A,B	Tests	Removed D7012 and Stu off the list
5	4,5,A,B	Org/Tests	Updated org chart and tests
6	5, All	Organization	Updated org chart in Section 5, updated formatting

Table of Contents

Appendices

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AAP	AASHTO Accreditation Program
ASTM	American Society for Testing and Materials
LQAM	Laboratory Quality Assurance Manager
LQAP	Laboratory Quality Assurance Plan
LSM	Laboratory Services Manager
MTE	Measuring and Test Equipment
NIST	National Institute of Standards and Technology
PM	Project Manager
PSP	Proficiency Sample Program
QA	Quality Assurance
QC	Quality Control
QMIS	Quality Management Information System
QMS	Quality Management System
QMSM	Quality Management System Manager
QSM	Corporate Quality System Manager
RSL	Redmond Soils Laboratory (“the Laboratory”)

1.0 Scope

This Laboratory Quality Assurance Plan (LQAP) describes the Quality Management System (QMS) established for geotechnical soil testing activities conducted by the GeoEngineers, Inc. (GeoEngineers) Redmond Soils Laboratory (RSL) in Redmond, Washington. This LQAP is based on the applicable requirements of American Association of State Highway and Transportation Officials (AASHTO) R18, "Standard Recommended Practice for Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories." It is designed to support third-party certification under applicable AASHTO guidelines, with scope of such certification confined to the AASHTO and ASTM International (ASTM) test methods listed in Appendix A, Table A-1.

2.0 Referenced Documents

Key references cited in this LQAP and its supporting procedures include:

- AASHTO R18 "Standard Recommended Practice for Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories"
- AASHTO "Standard Specifications for Transportation Materials and Methods of Sampling and Testing", Parts 1A and 1B, "Specifications", and Parts 2A and 2B, "Tests"
- ASTM Annual Book of Standards:
  - Volume 04.02, "Concrete and Aggregates"
  - Volume 04.08, "Soil and Rock (I)"
  - Volume 04.09, "Soil and Rock (II)"
  - Volume 14.02, "General Test Methods"
- AASHTO Accreditation Program (AAP) Procedures Manual

Current copies of these references are available via GeoEngineers' corporate technical library in Redmond, Washington, and will also be retained by the Laboratory Quality Assurance Manager (LQAM). See Appendix A, Table A-1 for specific AASHTO and ASTM Standards within the accredited scope of the Laboratory.

3.0 Terminology

Important terms used in this LQAP are defined as follows:

- **Audit**: A planned and documented activity performed to determine (by investigation, examination, or evaluation of objective evidence) the adequacy of and compliance with established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation.
- **Calibration**: Calibration refers to the periodic comparison of the measurement functions of Measuring and Test Equipment (MTE) to a device or standard of known and greater accuracy to ensure the continued accuracy, precision, reliability, and repeatability of the measurements or data so acquired.

- **Corrective action**: Measures taken to rectify conditions adverse to quality, and where necessary, preclude repetition; this includes root cause analysis and the actions taken to eliminate the cause of a detected nonconformance.
- **Client satisfaction**: The client's perception of the degree to which the client's requirements have been fulfilled. Achievement of client satisfaction is a primary goal in the implementation and continued improvement of this LQAP.
- **Nonconformance**: A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate.
- **Preventive action**: Actions focused on eliminating the cause of a potential nonconformance or other undesirable potential situation.
- **Quality Assurance (QA)**: An element of quality management focused on providing confidence that quality requirements are fulfilled.
- **Quality Control (QC)**: An element of quality management focused on actively fulfilling specific quality requirements.
- **QMS Record**: A completed document that furnishes evidence of the quality of items and/or activities affecting quality. See Section 5.9.
- **Root Cause Analysis**: An internal investigation which results in a statement of the ultimate underlying cause of a non-conformance.
- **Verification**: Confirmation that specified requirements have been met; may be comprised of such activities as inspections against specific requirements, performing alternate calculations, comparing new specifications with proven design specifications, undertaking tests or demonstrations, or reviewing documents prior to issue.

4.0 Significance and Use

This LQAP establishes the specific quality management practices applicable to the accredited laboratory testing services provided by the RSL. It describes the elements of the quality plan and how they are to be implemented. The existence of this LQAP does not in itself satisfy accreditation requirements; it is the consistent implementation of the plan that is essential.

5.0 Management Requirements

5.1 QUALITY MANAGEMENT SYSTEM

5.1.1 Relationship to Corporate QMS

The LQAP is a service area-specific quality plan, developed within the overall context of GeoEngineers' corporate QMS. The LQAP is designed to comply with the specific quality standards (i.e., AASHTO R18) applicable to the geotechnical laboratory testing service area and RSL operations.

5.1.2 Policy Statement

"GeoEngineers' Redmond Soils Laboratory is committed to providing geotechnical laboratory testing services that fully satisfy our clients' expectations for quality, and, to the extent possible given the characteristics of the samples being tested, the underlying requirements of the GeoEngineers' corporate Quality Management System, and applicable AASHTO and ASTM Standards. GeoEngineers' will endeavor to perform its professional services with that degree of skill and care ordinarily exercised under similar conditions by professional consultants practicing at the same time and locality. In keeping with this commitment, our objectives are to:

- *Achieve and maintain third-party certification of our laboratory in keeping with AASHTO R18 standards and guidelines;*
- *Maintain an acceptable performance rating with respect to our participation in all required proficiency sample or inter-laboratory testing programs; and*
- *Periodically audit the quality of laboratory performance and the overall effectiveness of our LQAP, and implement any required changes, as we seek to continually improve the quality of service embodied in GeoEngineers' commitment to "Find a Better Way".*

In achieving these objectives, we will ensure that our technical competencies, laboratory facilities and practices, and this LQAP remain suitable and appropriate for the range of services that we provide and the needs of our clients."

This policy will be communicated to all RSL staff as part of the training program described in Section 5.5 and will be periodically evaluated for continuing adequacy via the internal audit and management review processes described in Section 5.7. Where indicated, reasonable, achievable, and economically feasible improvements will be implemented. All personnel who are involved in laboratory testing activities or their support services will be provided access to these LQAP requirements and shall implement them in their work.

5.2 DOCUMENT CONTROL

Laboratory documents related to the management and function of the RSL shall be version controlled. An initial preparation date, revision number, and revision date shall be maintained on RSL management and testing documentation.

Laboratory test methods, practices, procedures, and specifications are available to laboratory staff in electronic form on a dedicated networked computer storage folder. Hard copies of these documents may be created as needed for the operations of the laboratory. The Laboratory Services Manager (LSM) and/or LQAM will ensure that these documents are the most current versions available.

This LQAP and all subsequent updates are subject to review and signature approval by GeoEngineers' Puget Sound Geotechnical Group Leader and LSM. All updates to this or other quality system documents must be version-controlled and dated.

Reference copies of the most recent version of the Technical Procedures and AASHTO and ASTM standards cited in Appendix A: Table A-1 will be retained on file by the LQAM and made readily available to laboratory

personnel. If any outdated standards are retained for reference, they will be marked "superseded" to prevent their inadvertent use.

5.3 ORGANIZATION

The legal name and address of the RSL, and company headquarters is as follows:

- GeoEngineers, Inc.
  17425 NE Union Hill Road, Suite 250
  Redmond, Washington 98052

All company officers are GeoEngineers employees. Principal officers are listed as follows:

- Chief Executive Officer: King Chin
- Chief Operations Officer: Lindsay Flangas
- Principal Geotechnical Group Leader: Stan Sadkowski, PE

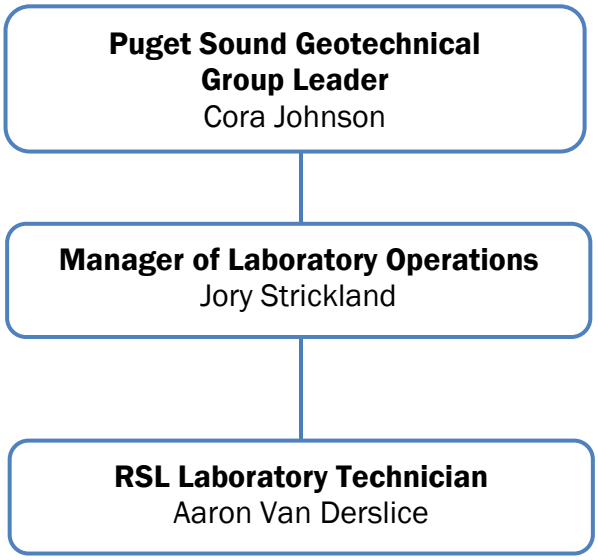

Figure 5.1 Redmond Soils Laboratory Organization

5.4 STAFF

Figure 5-1 describes the organizational authorities and relationships of the key staff members responsible for RSL operations. The primary responsibilities associated with the key RSL staff positions identified in Figure 5-1 are summarized in the following paragraphs. Position descriptions identifying duties, required skills, education, and experience, and professional resumes/biographical sketches for the individuals assigned to each position have been prepared and are maintained on file in the corporate Human Resources department. It is acceptable for one person to fulfill more than one defined role if they are qualified and are not prevented by conflicting responsibilities from performing the required duties.

- **Geotechnical Group Leader**: The Geotechnical Group Leader is ultimately responsible for ensuring that sufficient personnel, facility, and equipment resources are provided to support the range of laboratory testing services described in this LQAP.
- **Puget Sound Geotechnical Group Leader**: The Puget Sound Geotechnical Group Leader is responsible for review and signature approval of this LQAP and all subsequent modifications, for performance of the annual Management Review as required by R18 Section 5.7 with assistance and input from designated Laboratory personnel and serves as the Corporate Quality System Manager (QSM).
- **Laboratory Services Manager (LSM)**: The LSM will have overall responsibility for the technical operations of the laboratory and is equivalent to the "Technical Manager" as defined in AASHTO R18 Section 5.4.3.
- **Quality Management System Manager (QMSM)**: The QMSM will serve as the key point of contact for the qualification and training of laboratory staff; calibration and maintenance of laboratory test equipment; maintaining access to current versions of testing standards and procedures; maintaining Proficiency Sample Program (PSP) participation; management of the third-party AASHTO certification process; and other functions as specified herein. The QMSM, with the assistance and support of the Puget Sound Geotechnical Group Leader, is responsible for monitoring RSL performance with respect to the requirements of this LQAP, through the periodic auditing processes described herein. The LSM may also serve as the QMSM.
- **Laboratory Supervisor**: The Laboratory Supervisor coordinates testing activities and sample throughput on a day-to-day basis; maintains identification, custody, and tracking control over samples entrusted for testing or analysis, as well as the confidentiality of results; and reviews and approves test results. The Laboratory Supervisor is specifically delegated the authority to serve as the deputy QMSM in the event of the QMSM's absence. The LSM may also serve as the Laboratory Supervisor.

Specific duties in support of these responsibilities may be delegated to suitably trained personnel, provided that such delegation and training is documented and retained as required in Section 5.9.

5.5 TECHNICIAN TRAINING AND EVALUATION

All RSL staff will be trained in the requirements of this LQAP. In addition, all laboratory personnel will be trained prior to performing laboratory testing, with emphasis on the tests described in Appendix A, Table A-1. All laboratory training will be carried out by the QMSM, or a designated trainer having relevant expertise. Trainees will be provided copies of the most recent version of the assigned test procedure. After the standard has been studied, the QMSM will demonstrate the test procedure for the trainee. The trainee will then perform the test procedure under supervision on multiple samples until such time the QMSM is persuaded that the proficiency has been obtained. The QMSM will document the satisfactory completion of on-the-job training and forward the records to the employee's qualification and training file for retention, as described in Section 5.9.

Laboratory testing technicians are required to maintain familiarity with the most recent version of the AASHTO or ASTM standard for each test method which they perform. Technicians are responsible and expected to refer to the appropriate written method while performing the work, as necessary to assure compliance.

Personnel responsible for in-house calibrations will be trained in the appropriate calibration procedures and approved by the QMSM before calibrating MTE. This training will be documented in accordance with Section 5.9.

On a bi-annual basis, or whenever requested by laboratory management, each laboratory testing technician will re-demonstrate their competency in the test procedures they have been previously trained in. Technicians' proficiency demonstration will be supervised by the QMSM; the Laboratory Supervisor will likewise demonstrate proficiency under the supervision of the QMSM or LSM. Training records will be updated to indicate testing date and results, and routed to the employees' qualification and training files as previously noted. If unsatisfactory results are noted, the employee will be retrained under the QMSM guidance, as appropriate, until proficiency has been regained, and any potentially affected laboratory results will be reviewed.

5.6 INTERNAL AUDITS

The QSM, QMSM or designee will conduct or facilitate periodic internal audits of the Laboratory's activities to ensure that specified performance criteria are met, to identify specific opportunities for performance improvement, and to assess overall compliance with the requirements of this LQAP and its supporting procedures. Internal audits will be scheduled at least annually; additional audits may be conducted at the discretion of the QSM, QMSM or as requested by RSL management. Internal audit activities may occur throughout the year and need not be consolidated into one event, provided all elements of the LQAP are assessed and documented at least annually. Internal audits will examine the implementation of each element of the LQAP via an examination of records, interviews with RSL management and technical staff, and direct observation. The auditor will prepare a report summarizing the findings of the internal audit(s), identify deficiencies and required corrective/preventive actions, and establish a timeline for implementation. If necessary, the QSM, QMSM or designee will perform a follow-up audit to verify and document compliance.

5.7 MANAGEMENT REVIEWS

On at least an annual basis, the Puget Sound Geotechnical Group Leader will conduct and document an assessment of laboratory operations and the overall effectiveness of the LQAP. The review will be based on an evaluation of third-party certification results, proficiency testing program results, internal audit findings and any resulting corrective/preventive actions, client feedback including verbal or written technical complaints, and interviews with RSL management and technical staff. Policy adequacy will be specifically evaluated (see Section 5.1.2) and updated as appropriate. Observations and recommendations for improvement will be documented, communicated to affected personnel, and resolved as required by Section 5.8.

5.8 CORRECTIVE ACTION

Any nonconformance observed in the internal audit or management review process will be investigated and corrective/preventive measures implemented in a timely manner. Nonconformance's will be jointly evaluated by the Puget Sound Geotechnical Group Leader and designated technical staff to determine the root cause of the nonconformance, as well as appropriate action to correct the immediate and any long-term effects. The process also requires consideration of appropriate preventive measures for similar situations for which nonconformance have not yet been detected but could potentially exist.

Should a customer complaint arise, it will be treated and investigated as an issue of nonconformance, as stated above. A record of customer complaints and resulting corrective actions will be maintained by the QMSM.

5.9 RECORDS RETENTION

Records are defined as completed, legible documents, in hard copy format, that furnish evidence of the satisfactory completion of the client's required scope of work, as well as the quality of the laboratory testing services provided, the completeness and quality of data generated, and the satisfactory implementation of this LQAP. Records will be maintained and organized by project in access-controlled fire-resistant metal filing cabinets, by or at the direction of the LM. Records will be physically isolated from work in process or draft/working versions of documents and at a minimum will include:

- **QMS records**, including a historical file of all issued versions of this LQAP and supporting procedures; records of third-party certification audits, internal audits, management reviews, and proficiency sample testing; qualifications of subcontractors providing services under the accredited scope of the RSL; position descriptions, professional resumes, training records and competency evaluation records for laboratory technicians and technical staff; and MTE calibration/maintenance records.
- **Project technical records**, including client contract/purchase order documentation, contract reviews, deliverables, approved test results, and associated project correspondence.

Unless otherwise directed by the client or GeoEngineers' corporate counsel, project records will be retained for a minimum period of 5 years, after which they may be archived or (if specifically authorized by the client or corporate counsel) destroyed. QMS records, including equipment calibrations, audits, and PSP results will be retained for a minimum of 5 years, and may be retained indefinitely.

QMS records and project technical records which also exist as electronic files will be protected from unauthorized modification. These files will be permitted to reside only on those servers or hard drives authorized by RSL management. An electronic data security program including backup and restoration procedures will be maintained in conjunction with the corporate GeoEngineers Information Technology department.

6.0 Technical Requirements

6.1 EQUIPMENT

The QMSM will maintain a current inventory of all major MTE required to perform the laboratory's accredited scope of testing. For each item, the inventory will include a unique ID number, the equipment name, the manufacturer, model and serial number, and date placed in service. This List will be maintained separately from this LQAP.

The QMSM will maintain an MTE maintenance and calibration list meeting the requirements of AASHTO R18 Section 6.1.2.1. The list will reference the specific written procedure that should be employed. Equipment manufacturer's maintenance and calibration requirements will be summarized, referenced, included or attached. This list will be maintained separately from this LQAP.

6.2 GENERAL EQUIPMENT PROCEDURES

All MTE calibrations, standardizations, checks, or maintenance performed in-house must be done according to written and approved procedures and by technicians specifically trained to perform the procedure. The MTE required to be calibrated, checked or standardized will be determined by Tables A1.1 through A1.9 of AASHTO R18. The QMSM is responsible for ensuring that all required calibration, standardization, and checks are completed as required by the stated procedures and schedules.

MTE removed from service, or newly acquired without manufacturer certification shall be calibrated as above prior to being placed in service. Likewise, any MTE sensitive to being moved, or changing environmental conditions shall be calibrated as above prior to being placed in service.

If National Institute of Standards and Technology (NIST) traceability or other calibration requirements for specific equipment cannot be satisfied in-house, a certified third-party calibration contractor will be retained to perform the work. The written equipment calibration procedures must indicate if the work is performed by an outside agency. The calibration agency must provide certificates or other documents establishing their current accredited status, and calibration and traceability of the equipment and reference standards used. The RSL will retain these documents, as well as all in-house and third-party calibration records, in accordance with LQAP Section 5.9.

6.2.1 Procedures for Individual Equipment

Where standardization, calibration, checks, and maintenance procedures are not provided for by Standard Test methods, manufacturer operating instructions or in-house procedures will be developed, recorded and maintained. These procedures will be maintained separately from this LQAP.

6.3 EQUIPMENT INTERVALS

The required maximum calibration intervals and procedures will be determined by Tables A1.1 through A1.9 of AASHTO R18, the equipment manufacturer's instructions, or the requirements of the governing test method, whichever is most stringent. Standard intervals may be exceeded only if the MTE is calibrated, standardized, checked, or maintained prior to each use.

6.4 EQUIPMENT RECORDS

Records of MTE calibration, standardization, checks, and maintenance will be maintained by the QMSM. Records will include:

- A description of the equipment being calibrated, standardized, checked, or maintained;
- The date that the work was performed;
- The name of the person performing the work;
- The calibration, standardization, check, or maintenance procedure used;
- Identification of reference equipment, or measurement standards used; and
- Results of the work performed including information collected and measurements made during the work.

When the work is performed by an outside agency, a verifiable statement or symbol regarding accreditation of the agency.

6.5 SAMPLE MANAGEMENT

The RSL will provide and maintain sample storage conditions which do not compromise the measured characteristics of the samples. When samples require storage or conditioning under specified environmental conditions, these conditions will be maintained, monitored and recorded. Due consideration will be given to the laboratory's ability to maintain the specified conditions before agreeing to perform the work.

Test samples will be protected from contamination, injurious disturbance, deterioration, misidentification or loss at all times before, during and after testing. This includes samples that are retained in short- or long-term storage, particularly since retained samples might become of evidential importance if legal or other questions arise about the work at a subsequent date, which might be years removed from the original testing.

Samples waiting testing will be kept physically separate from retained sample storage, or otherwise clearly identified. Samples that are not large bulk sample quantities will be retained for 90 days following completion of testing. Large bulk samples typically used for Proctor testing will be discarded after testing given the alteration of the sample by testing. New samples will be obtained if further testing is needed. Samples will be discarded in accordance with GeoEngineers' General Conditions or the project-specific contract, whichever controls, unless long-term retention is requested by the Project Manager.

In accordance with GeoEngineers Standard Operating Procedure and ASTM D4220 sample handling, receiving and shipping, the laboratory will maintain a defined system by which each sample received in the lab is tracked. Each sample will be assigned a unique ID which accompanies it throughout its existence, which is referenced on all documents generated, and which can be used to easily determine the location and status of the sample at any time. Incoming samples will be recorded in a logbook or equivalent tracking system maintained by the Field Logger, Laboratory Technician or Laboratory Supervisor. At a minimum, the following information will be recorded:

- GeoEngineers job number and client or project name;
- Boring, test pit, or other exploration identifier;
- Sequential sample number;
- Sample collection depth and/or elevation;
- Date the sample was collected and the date it was received in the laboratory;
- Name or initials of the person from whom the samples were received; and
- Date testing was completed.

6.6 TEST RECORDS

A document detailing the methods used to produce test records and to prepare, check and amend test reports will be drafted and maintained by the QMSM, LSM, or qualified designated personnel. This document will be maintained separately from this LQAP.

Test records must be complete and contain all information required to verify test reports. This includes original observations, calculations, derived data, photographs (if taken), and identification of sampling and testing personnel.

Unless otherwise specified by GeoEngineers' client, test reports will at a minimum clearly present all the information required by AASHTO R18, Table 1:

- Identification of the report and the date issued;
- Description, identification and condition of the test sample(s);
- Identification of the standard test method used;
- Test results and any other data required by the standard test method;
- Identification of any test results obtained from tests performed by a subcontractor; and
- Name of the person(s) accepting technical responsibility for the test report.

The information listed in AASHTO R18, Table 2 must be available and traceable to the test reports:

- Name and address of the testing laboratory;
- Name and address of the client and identification of the project;
- Date of receipt of the test sample;
- Date(s) of test performance; and
- Deviations from, additions to, or exclusions from the AASHTO standard, if applicable.

All test reports will bear evidence they have been reviewed and approved by the Laboratory Supervisor, LSM or other designated person accepting technical responsibility for the results prior to submittal to the client. Titles, signatures, and approval date will be specifically noted on the report. Units and significant digits of test result data must conform to the requirements of the standard test method, unless otherwise requested by the client. Reference to AASHTO accredited status of results, if made, will conform to the AAP Procedures Manual, Section 8 "Conditions for Accreditation".

If test data is generated and formatted for inclusion in a geotechnical report or use in internal analysis, the final deliverable may not require all of the above information. However, the supporting test records must include all required information and must bear evidence of technical review. Original observations, notes, test data, calculations, and identification of personnel performing the work will be retained.

Corrected or amended test reports will be clearly identified as such and must be traceable to the original report and its supporting data.

6.7 SUBCONTRACTING/SUBCONSULTANT AGREEMENTS

It is GeoEngineers' policy to require a written agreement (Master and Work/Task Order or Project-specific Agreement) anytime a Subcontractor/Subconsultant is hired to provide services for our company (regardless of value) and that the agreement is signed prior to commencement of services.

GeoEngineers has a long-standing relationship with many Subcontractors/Subconsultants. We recognize that our Subcontractors/Subconsultants are an integral part of our team and key to our overall success. GeoEngineers primarily hires based on previous experience where there is a demonstrated track record of performing work safely and a commitment to quality, schedule and managing costs and resources. There are times when we need services in a geographic area where we do not have an established relationship with a Subcontractor/Subconsultant, or specialized services are required. In these situations, we may request bids/proposals or award the work on a sole source basis to the Subcontractor/Subconsultant that provides the best value to our company and clients in terms of price, safety performance, and technical expertise. When subcontracted laboratory services are required, GeoEngineers hires laboratories that are Accredited by AASHTO, Re:Source (formerly AMRL) and/or US Army Corps of Engineers. The results are reviewed by GeoEngineers' QMSM for accuracy. The results are also reported using the subcontractor's data reports and are notated as third party results in GeoEngineers final deliverables.

6.8 ASSURING THE QUALITY OF RESULTS

As a means of assessing the validity of test results, the laboratory will maintain continuous enrollment in a PSP or inter-laboratory comparison program acceptable to AASHTO for each test method noted in Appendix A, Table A-1, unless no such program is available. The QMSM will assign PSP testing to laboratory personnel who are trained in the test method(s), and will review the results prior to submitting them to the PSP provider. The QMSM will respond to any poor results (beyond two standard deviations of the grand average) in accordance with the requirements of the AAP Procedures Manual, Section 3.3.

The laboratory facilities for testing, including but not limited to energy sources, lighting, and environmental conditions, must be such as to facilitate correct performance of the tests. Care will be taken that the environmental conditions do not invalidate the results or adversely affect the required quality of any measurement.

If commercial software tools or internally developed spreadsheet applications are used for data reduction, their mathematical functions will be verified and documented prior to first use and at least annually thereafter. Re-verification is required whenever the software is modified or if inaccuracies are suspected. Software must be version-controlled and protected from unauthorized modification by write-protection, passwords, or other suitable means.

Results of the above activities will be documented and retained in accordance with LQAP Sections 5.8 and 5.9.

Appendices

Appendix A
Scope of Accredited Testing

APPENDIX A:
Scope of Accredited Testing

This table presents the laboratory test methods currently included in the Redmond Soils Laboratory (RSL) accredited scope for American Association of State Highway and Transportation Officials (AASHTO).

TABLE A-1: TECHNICAL PROCEDURES AND REFERENCED TEST METHODS

PROCEDURE TITLE	AASHTO STANDARD	ASTM STANDARD
Quality System		
Quality System for CMT Laboratories	R 18	
Tests		
Dry Preparation of Soil Samples	R58	D 421
Moisture-Density (Proctor) of Soils, Standard Effort	T99	D 698
Specific Gravity of Soils		D 854
Material Finer than a No. 200 Sieve by washing		D 1140
Moisture-Density (Proctor) of Soils, Modified Effort	T180	D 1557
California Bearing Ratio		D1883
Unconfined Comp Strength UCS		D2166
Moisture Content of Soil and Rock	T265	D 2216
One Dimensional Consolidation		D 2435
USCS Soil Classification		D 2487
Visual and Manual Soil Classification		D 2488
Unconsolidated Undrained UU		D 2850
Organic/Ash Content by Oven Method	T267	D 2974
Liquid Limit, Plastic Limit, PI (Atterberg Limits)	T89/T90	D 4318
Consolidated Undrained CU		D 4767
Point Load Strength Index of Rock		D5731
Particle Size Analysis of Soils by Hydrometer		D7928
Material Finer than No. 200 Sieve	T11	C117
Sieve Analysis of Fine and Coarse Aggregates	T27	C 136
Reducing Samples of Aggregate to Testing Size		C702
pH of Soils for Corrosion Testing	T289	