



April 20, 2022

Ensign Engineering and Land Surveying Inc.
Attn: Justin Christensen
88 E Fiddlers Canyon Road, Ste 210
Cedar City, UT 84721

Subject: Geotechnical Investigation Proposal
Cedar Highlands Tank, Cedar City, UT
Proposal No. YP4222

Justin,

Landmark Testing & Engineering is pleased to present this proposal to complete a geotechnical investigation for the proposed Cedar Highlands water tank to be located NE of the existing water tank off of Cedar Highlands Commons Drive in Cedar City, Utah.

PROJECT UNDERSTANDING

A KMZ file showing the proposed location of the water tank site was provided to us and a site visit was conducted on April 19, 2022, in preparation of this proposal. The location of the site is at GPS coordinates 37.63274 N, 113.0360 W. We understand that the tank is to be a 0.5-million-gallon, possibly partially buried, concrete or steel water tank with a diameter of approximately 65 feet and wall height of approximately 20 feet.

The soils on the project site are mapped by the Utah Geological Survey (UGS) Qac: alluvial and colluvial deposits bordering mass landslide units on the east of the site.¹ The site is relatively level with some buried boulders present on the surface.

In order to determine the subsurface conditions of the soils on the project site and provide recommendations for earthwork, subgrade preparation, and foundation design for the water tank we propose the following scope of work.

SCOPE OF WORK

Task 1 - Geotechnical Investigation

We propose to complete 3 test pits proximate to the footprint of the tank. Test pits will be excavated with a trackhoe to depths between 15 and 20 feet below the existing ground elevation or to refusal, depending on subsurface conditions and the capacity of the excavation equipment. Bulk samples will be obtained, as appropriate, to assess subsurface conditions.

¹ Interactive Geologic Map Portal, Retrieved April 19, 2022, from Utah Geological Survey, <https://geology.utah.gov/apps/intgeomap>.



A continuous log of each investigation will be maintained in the field. Test pits will be backfilled immediately upon completion of sampling and logging.

Task 2 - Laboratory Testing

Depending on subsurface conditions encountered, laboratory testing will be performed to evaluate soil properties and to provide data for earthwork and foundation design. We anticipate that testing will include the following items.

- Mechanical gradations and Atterberg Limits to assist in soil classification and for correlations with design parameters.
- Collapse/swell tests to assess potential volume change of soils upon wetting.
- Unit weight and moisture content for correlation with design parameters.
- Water soluble sulfate for corrosion potential of soils to concrete.

Task 3 - Geotechnical Investigation Report

Landmark Testing & Engineering will issue a final report that will include the following:

- Site map showing the project layout with investigation locations.
- Investigation logs that will include sampling method, sample locations, soil descriptions and classifications in accordance with ASTM D2487, and depth to water (if encountered).
- Soil/bedrock classification and terminology chart for the logs.
- Description of surface and subsurface conditions encountered including geologic setting, and location of groundwater, if encountered.
- Results of laboratory tests.
- Seismicity and seismic coefficients.
- Slope stability analysis.
- Liquefaction and lateral spread analysis.
- Earthwork recommendations including excavation requirements, use of on-site materials, earthwork specifications, and compaction requirements.
- Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive/collapsible soils; total and differential settlement and varying soil strength.
- Lateral earth pressures for on-site and imported material including, active, at-rest, passive and coefficient of sliding friction. Coefficients will also be provided for seismic loading.
- Cement type recommendations.

Task 4 – Shear Wave Velocity Survey (Optional)

To provide adequate data for accurate seismic site classification, we propose to determine the average shear wave velocity of the upper 100 feet ($V_{s,100}$) of the site soil profile according to the Refraction Microtremor (ReMi) method. We anticipate that based on our geotechnical investigation, a site class D will be justified and accepted by design reviewers. Although, our experience with ReMi surveys in the southern Utah area has shown shear wave velocities of the upper 100 feet ($V_{s,100}$) typically classify the soil site class as C. If it is determined by the structural engineer to be advantageous for design of the tank to have a site class C vs. site class D, choosing





to perform a shear wave velocity survey may prove to be cost effective. Conducting a shear wave velocity survey does not guarantee site class C will be determined. We propose a minimum of 1 survey be completed on the project site. If chosen, the lump sum cost for the ReMi survey will be **\$3,000.**

BASIS OF COMPENSATION

For our engineering services outlined in Tasks 1-3, Landmark proposes a **LUMP SUM AMOUNT of \$5,100.00.**

Landmark is prepared to commence with the investigation within 10 business days of authorization. A final report will be provided within 5 weeks of the investigation. Preliminary data can be provided once the investigation is completed. If this proposal is acceptable, please sign and return the authorization form below or respond in email providing your authorization to proceed with the work.

If you have any questions do not hesitate to call.

Sincerely,

LANDMARK TESTING & ENGINEERING

Steven Wells, PE
Chief Executive Officer
Geotechnical Manager

PROPOSAL AUTHORIZATION

To execute this proposal, please sign and complete the authorization information below and return one copy of the authorized proposal to our office.

Brent F. Hunter
Authorized By (please print)

[Signature]
Signature





Board Chairman		Central Iron County WCO	
Title		Firm	
88 E. Fiddlers Canyon Rd Ste #220			
Address			
Cedar City	UT	84721	435-865-9901
City	State	Zip Code	Telephone
4-27-2022			
Date		Purchase Order No./Project Tracking No. (if applicable)	

