



City of Holladay

REQUEST FOR PROPOSALS (RFP) for Skate Park Design-Build Services

The City of Holladay (City) seeks proposals for design-build services for a new, approximately 10,000 square foot skate park located on City-owned property on the south side of Holladay City Park at 4580 South 2300 East, Holladay, Utah 84117. The City has worked with a firm to prepare a design concept that is reflective of preliminary public input and City Council support. The concept will be used as the guide for the final design and construction of the facility.

Project Name: **Holladay Skate Park**

Proposal Submissions: **DEADLINE - December 18, 2020 at 5:00 p.m. (MST)**
Email an electronic response (single PDF of complete proposal) with subject "Holladay Skate Park RFP Response" to hsmith@cityofholladay.com. There will be no formal public opening or reading of the proposals.

RFP Contact: Holly Smith
City of Holladay
Telephone: 801-272-9450, ext. 118
Email: hsmith@cityofholladay.com

Questions & Answers: Please submit all questions in writing via email to Holly Smith at hsmith@cityofholladay.com. The question period will open concurrently with the release of the RFP. All questions must be submitted no later than December 11, 2020 at 5:00 p.m., MST. All questions and answers related to the RFP will be posted on the City's website, www.cityofholladay.com, by December 15, 2020. The City requests that interested firms refrain from contacting other City staff or officials regarding this project.

Modifications & Addenda: Any modifications or addendums to the RFP will be made in redline form on the website. Please check the RFP on the website for changes.

Proposals will be evaluated following the submission deadline. If the selection committee determines that additional dialogue with the finalists is required to determine the recommendation for project award, the City may coordinate with the firm(s) to make virtual meeting arrangements. Proposals received after the stated deadline will not be considered. The acceptance of any proposal made pursuant to this invitation shall not be binding until a design-build agreement has been executed. The City reserves the right to accept or reject any or all bids/proposals or part thereof, or to accept one or more items of a bid/proposal without obligation as to other items, and to waive any informalities or irregularities in a proposal.

1. Scope of Work

- a. Location of Project: The project site is located on an approximate 10,000 square foot strip of City-owned property on the south end of Holladay City Park, adjacent to a private lumber business, at approximately 4580 South 2300 East, Holladay, Utah 84117.
- b. Background: The City of Holladay engaged a skate park consultant in the Fall of 2020 to provide design concept services for the proposed facility. The consultant worked with the City staff project team, prepared two preliminary concepts, hosted a virtual public input meeting, reviewed nearly 475 public comments and other feedback, and prepared a final design concept and cost estimate. The concept and cost estimate were presented to the Holladay City Council on November 19, 2020 and subsequently, the Council approved \$400,000 in a budget amendment on December 3, 2020 for the design-build of the project. The City would like the new facility constructed and open to the public in Summer 2021. The City will provide available site information to the selected firm, including but limited to, a completed geotechnical report and City Park master plan. (provided in Section 11. Exhibits of this RFP), and a site topographical and feature survey will be provided in AutoCAD.
- c. General Scope: It is expected that the existing design concept will be used as the baseline for the new facility. The following is the general scope of work to be performed after the selected firm has entered into a contract with the City.
 - i. Review the project site and design concept, and make recommendations for any modifications to the design approach based on findings.
 - ii. Work with Holladay Skate Park Committee (to be established) consisting of residents, skate boarding community representatives, local businesses, City staff and officials, and other interested parties to fine tune the proposed final design.
 - iii. Host a general public input event on the proposed final design.
 - iv. Provide a presentation of the proposed final design to the Holladay City Council.
 - v. Finalize the design considering committee, public and City Council feedback using the latest design principles and high-quality materials.
 - vi. Prepare a construction document package including drawings (plan and sections views), construction details, and technical specifications.
 - vii. Work with City staff to obtain requisite construction approvals and permits.
 - viii. Construct the new skateboard facility in turnkey fashion. Meet with the City staff weekly or as frequently as deemed necessary to review project progress and address issues, as needed, during construction.

- ix. Ensure satisfaction of facility inspections and other pre-public opening requirements.
- d. The project design and construction shall meet the budget of \$400,000, with some flexibility provided for potential add-on elements exceeding that amount pending the outcome of the final design process.

2. Instructions to Firm

- a. Project Timetable:
 - i. The following timetable has been established for this project:
Proposal Deadline: December 18, 2020 at 5:00 p.m. (MST)
Approximate Notice of Award: On or before January 22, 2021
Approximate Commencement of Work: February 8, 2021
Completion of Work: Summer 2021
- b. Pre-Submittal Site Familiarity: Firms are strongly encouraged to visit or become familiar with the project site and research the existing conditions prior to submitting a proposal.
- c. Procedure: The procedure for response to this RFP, evaluation of proposals, and selection of a firm is as follows:
 - i. Interested entities will prepare and submit proposals according to the Project Timetable contained above.
 - ii. The City and/or its representatives will evaluate all submittals in accordance with the evaluation criteria.
 - iii. Oral presentations or interviews may be requested by the City from selected firms. This may be done by phone or virtual meeting.
 - iv. The City will select a first-ranked firm based on the review of qualifications and subsequent oral presentation or interview (if conducted).
 - v. A Design-Build Agreement incorporating the provisions, terms, and conditions of this RFP will be negotiated between the City and the selected firm.
 - vi. This process may be repeated with another qualified firm if an agreement cannot be reached with the first-ranked firm.
- d. Submission of Proposal:
 - i. Deadline: Friday, December 18, 2020 at 5:00 p.m. (MST)
 - ii. Email an electronic response (single PDF of complete proposal) with the email subject "Holladay Skate Park RFP Response" to hsmith@cityofholladay.com.
 - iii. Proposals will not be publicly opened or read.
 - iv. Proposals must be complete in meeting the requirements of this RFP. Additional information provided after the deadline will not be considered unless specifically requested by the City.

3. Proposal Organization and Content

The comprehensive RFP response shall include all requested information and documentation. Incomplete submittals may be deemed non-responsive. Submittals shall contain no more than 10 single-sided pages, excluding exhibits and resumes, which should be placed in the proposal appendix. The proposal shall include the following, in the order outlined below:

- a. Transmittal letter: (not included in page count) The letter of transmittal shall be on official business letterhead and shall include the following:
 - i. A statement of the respondent's intent to participate in the contract and comply with all terms and conditions, as indicated in the RFP or exceptions taken thereto.
 - ii. A statement of affirmative action that the respondent does not discriminate in its employment practices with regard to race, color, religion, age (except as provided by law), sex, marital status, political affiliation, national origin, or handicap.
 - iii. Certification statement to the effect that the person submitting the packet is authorized to do so on behalf of the respondent.
 - iv. Name of the key contact person with his/her title and telephone numbers. Also, indicate a back-up contact person, if the key contact person is not available.
- b. Work Plan and Project Approach: This section should describe the methodology and process proposed to complete the scope of work defined in Section 1.c, including any potentially innovative or creative approaches or solutions for the project. It should identify any proposed strategies to be used to control costs, maximize economy, and identify advantages of the firm to the City. Restatement of the scope outlined in this RFP is not necessary; however, submittals should include any suggested modifications thereto (additions, deletions, alternate ideas). This section shall also include what roles, if any, the firm would expect the City to perform to complete a successful project. This section should also include:
 - i. Specific exclusions.
 - ii. Assumptions made in preparation of the Work Plan.
 - iii. Proposed project schedule
- c. Qualifications/Experience: Provide an overview or background of the firm. This section should also include at least 3 project examples where the firm provided similar design-build services for a municipality or government entity. Also, provide a list of projects completed in the past 3 years.
- d. Key Personnel and Project Team: This section should contain the following information:
 - i. Organizational chart identifying the project manager, showing the team involved and breakdown of responsibilities.
 - ii. Summary of key individual's experience scheduled to participate on the project.
 - iii. List any subconsultant/ subcontractor roles that will be needed to properly complete the project. Provide names of subconsultants/ subcontractors, if known at this point, and indicate if the firm has worked with them on prior projects.
- e. References: Please provide the name, telephone number and email address for at least 3 references from past projects.
- f. Warranty: The City will require a minimum one-year warranty of workmanship and materials. Describe any additional or extended warranty or guarantees provided to the City upon completion of construction.

- g. Capacity, Financial Stability, Legal History: Describe the firm's workload capacity to perform the requested design-build services and financial stability. Detail any claim, suit, or demand made against the firm relating to the firm's work and/ or business methods on a construction project.

4. Evaluation Criteria

Contract negotiations will be initiated with the highest-ranking firm based on an evaluation of the following criteria:

- a. Transmittal Letter: Check that complete information was provided as requested.
- b. (30%) Work Plan and Project Approach: This category evaluates the firm's understanding of the project, knowledge of the needs of the skateboard community, proposed project schedule, technical approach, and plan for managing the Project.
- c. (30%) Qualifications/Experience: This category deals with the firm's performance on previous projects of similar size and content. Experience relates to the overall assessment of the firm's assigned personnel and previous experience with this type of project; a knowledge of skate park components and how to lay them out; an expert understanding of materials and how to use them in the construction of a skate park; exceptional skill and technical knowledge of how to properly construct skate park facilities; and the labor force, equipment, and training to construct the needed facility.
- d. (15%) Key Personnel and Project Team: This category deals with the education, training, and experience level of key personnel proposed for this project, as well as previous experience working together as a team.
- e. (10%) References: The review committee will be looking for references that have been impressed by the firm's work and ethics. References from other municipalities or government entities will be of particular interest.
- f. (10%) Warranty: The review committee will consider the advantage of contracting with a firm that will warranty their work. Warranties that are broad or cover longer time frames will be factored into the decision.
- g. (5%) Capacity, stability and history: This information will be used to determine the stability of the firm. The degree of a firm's sound history and current stability will be considered advantageous.
- h. Phone interview (if necessary): Details, clarifications, and information gathered by phone following the receipt of qualification statements will be used to weigh the advantages of each firm.

5. Oral Presentation/Interview

As part of the proposal evaluation process, selected firms may be invited to make oral presentations to the City and/or respond to the panel's questions via virtual meeting. These

presentations must be made by the same project team personnel who will be assigned to the project should they be awarded a contract.

6. Submittal Ownership

All submittals (and the information contained therein) shall become the property of the City. Submittals may be reviewed and evaluated by any person at the discretion of the City. No submittal shall be returned to the respondent regardless of the outcome of the selection process.

7. Acceptance of Proposal

- a. The City reserves the right to cancel or modify the terms of this RFP and/or the project at any time and for any reason preceding the execution of a contract and reserves the right to accept or reject for any reason, any or all submittals pursuant to this request for qualifications.
- b. The responding party agrees that the City may terminate this procurement procedure at any time and for any reason, and the City shall have no liability or responsibility to the responding party for any costs or expenses incurred in connection with this RFP, or such party's response.

8. Withdrawal of Submittal

The submittal may be withdrawn upon request by the firm, however the physical document will not be returned.

9. Submittal Cost

Cost for developing submittals and making presentations are entirely the responsibility of the firm and shall not be chargeable in any manner to the City.

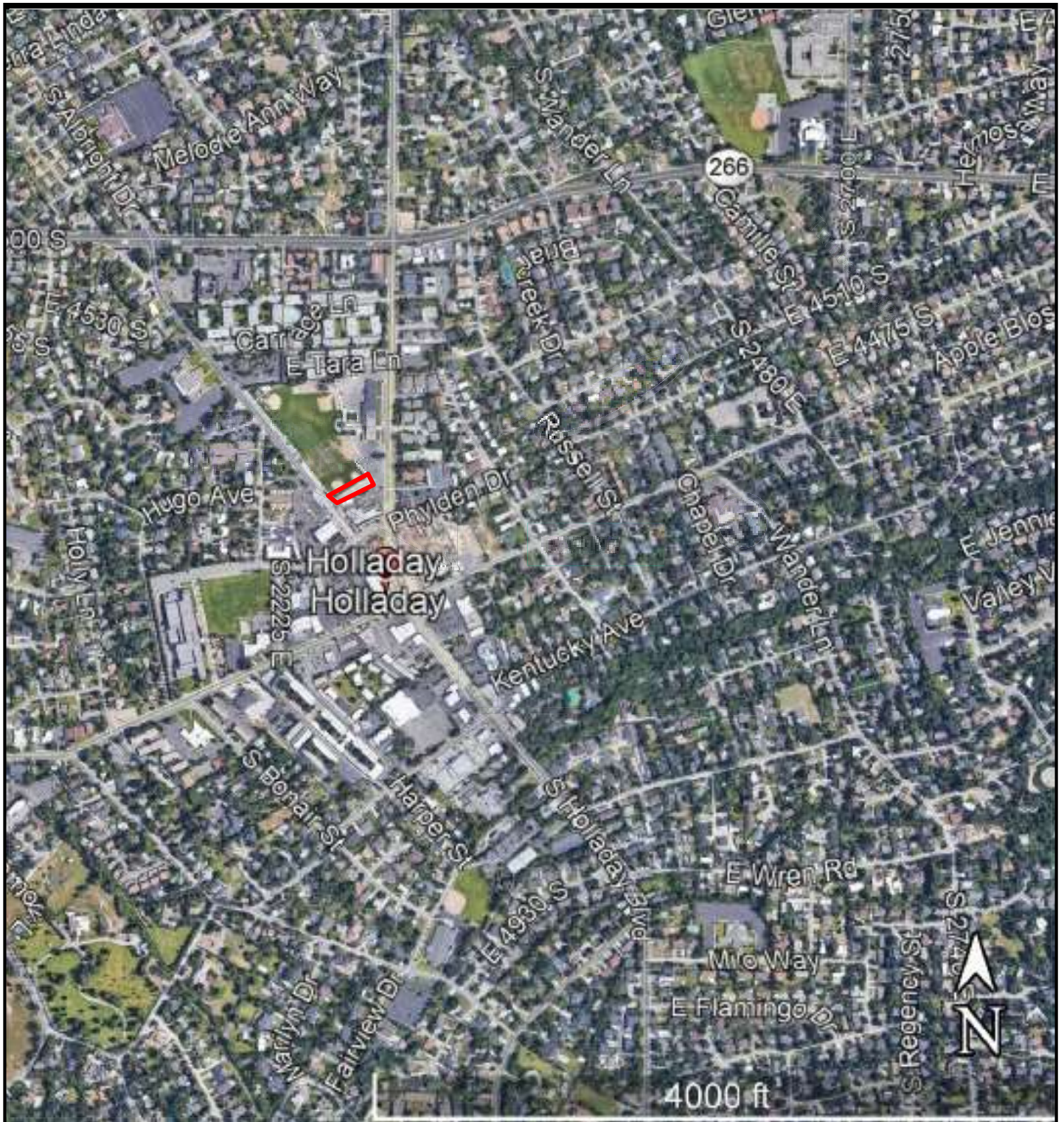
10. Reservation of Rights

The City reserves rights to:

- a. Reject any and all submittals in response to this RFP.
- b. Waive or modify any irregularities in submittals.
- c. Request additional information or modifications to submittals prior to award if such is in the best interests of the City.
- d. Use any ideas in the submittals received, unless covered by legal patent or proprietary rights. Selection or rejection of a firm does not affect this right.
- e. In the event of unsuccessful contract negotiations or contract termination, enter into contract negotiations with other qualified firms that submitted acceptable qualifications packets.
- f. Cancel or modify the terms of this RFP and or the project at any time and for any reason preceding the execution of a contract and reserves the right to accept or reject any or all submittals pursuant to this request for qualifications.

11. Exhibits

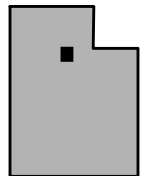
- a. Site Location & Boundary
- b. Design Concept Renderings
- c. Geotechnical Report
- d. City Park Master Plan



Base Maps:
 Google Earth –
 Utah AGRC Hybrid Base Map



Site Boundary Location



MAP LOCATION

GeoStrata
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Holladay City
 Holladay City Skate Park
 2300 East Holladay Boulevard
 Holladay, Utah

Project Number 1338-002

SITE VICINITY MAP

**Plate
 A-1**











14425 South Center Point Way Bluffdale, Utah 84065
Phone (801) 501-0583 | Fax (801) 501-0584

**Geotechnical Investigation
Holladay City Skate Park
2300 East Holladay Boulevard
Holladay City, Utah**



GeoStrata Job No. 1338-002

Prepared for:
Holladay City
4580 South 2300 East
Holladay, Utah

Attn: Mr. Jared Bunch

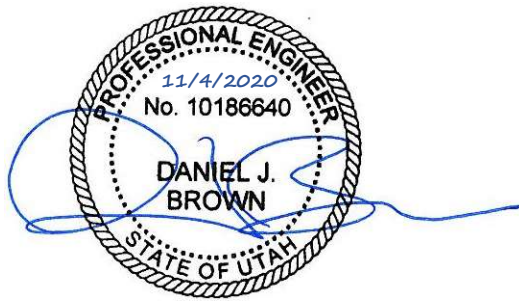
Prepared for:

Holladay City
Attn: Mr. Jared Bunch
4580 South 2300 East
Holladay, Utah

**Geotechnical Investigation
Holladay City Skate Park
2300 East Holladay Boulevard
Holladay, Utah**

GeoStrata Job No. 1338-002

Prepared by:



Daniel J. Brown, P.E.
Senior Geotechnical Engineer

A handwritten signature in blue ink, consisting of stylized, overlapping loops and strokes.

J. Scott Seal, P.E.
Associate Principal Engineer

GeoStrata
14425 South Center Point Way
Bluffdale, UT 84065
(801) 501-0583

November 4, 2020

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	Plate A-2	Exploration Location Map
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Appendix C	Plate C-1.....	Lab Summary Report
	Plate C-2.....	Atterberg Limits Test Results
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	Plate C-5.....	CBR Test Results

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed Holladay City Skate Park to be constructed at approximately 2300 East Holladay Boulevard in Holladay City, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations (if needed), slabs-on-grade, and pavements.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are complied with.

Subsurface conditions were investigated through the advancement of three boreholes to a depth of 16½ feet below the existing site grade. Subgrade soils at the site consist of 5 to 10 feet of undocumented fill soils composed of mixtures of clay, sand and gravels. Underlying the undocumented fill soils, we encountered deposits mapped as consisting of Pleistocene-aged lacustrine clay and silt soils associated with the Bonneville Lake Cycle. Where observed, these soils consisted of stiff, moist, brown to gray Lean CLAY (CL) with varying amounts of fine-grained sand. Groundwater was not encountered within any of the boreholes advanced as part of this investigation.

Due to the presence of relatively thick undocumented fill soils underlying the subject property, there is an increased potential for the concrete slabs to experience premature distress and/or require occasional maintenance if these soils are left in place. The only way to eliminate this potential is to over-excavate the fill soils until native soils are encountered and bring the site back up to design grade using properly placed and compacted structural fill. GeoStrata understands that it may not be economically feasible to over-excavate the entirety of undocumented fill soils, and as such, as a minimum, it is recommended that all slabs associated with the skate park features (and not subjected to vehicle loads) be constructed over a minimum of 4 inches of compacted gravel overlaying a minimum of 12-inches of properly placed and compacted structural fill.

The table below presents equivalent recommended pavement sections based on the above assumptions. Any pavement option below may be selected for roads based on city requirements and economic considerations.

Rigid Pavement Section

Rigid Pavement Section	
Concrete (in)	Untreated Base Course (in)
5	6

Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the MDD as determined by the ASTM D-1557. Our concrete design assumes that load transfer components will be incorporated into the design of the concrete.

As mentioned previously, Due to the presence of relatively thick undocumented fill soils underlying the subject property, there is an increased potential for pavements to experience premature distress and/or require occasional maintenance if these soils are left in place. The only way to eliminate this potential is to over-excavate the fill soils until native soils are encountered and bring the site back up to design grade using properly placed and compacted structural fill. GeoStrata understands that it may not be economically feasible to over-excavate the entirety of undocumented fill soils, and as such, as a minimum, it is recommended that all pavement sections be constructed over a minimum of 24-inches of properly placed and compacted structural fill. This recommendation has been reflected in pavement sections provided above in the thickness of the “Granular Borrow” portion of the pavement section.

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT:

Do not rely on the executive summary. The executive summary omits several details, any one of which could be crucial. Read and refer to the report in full. Do not rely on this report if this report was prepared for a different client, different project, different purpose, different site, and/or before important events occurred at the site or adjacent to it. All recommendations in this report are confirmation dependent. A two-page document prepared by GBA explains these items with greater detail is found in Appendix D (Plates D-1 and D-2).

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed Holladay City Skate Park to be constructed at approximately 2300 East Holladay Boulevard in Holladay City, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading, slab-on-grades, and exterior concrete flatwork.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal, dated October 5, 2020 and your signed authorization.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report (Section 7.1).

2.2 PROJECT DESCRIPTION

The subject property is located approximately 250 feet to the northwest of the intersection of 2300 East and Holladay Boulevard in Holladay City, Utah (see Plate A-1, *Site Vicinity Map*). Our understanding of the proposed improvement is based on information provided by the client. We understand that the improvement will consist of the construction of a skate park consisting of concrete ramps and slabs as well as a potential 6-ft deep “bowl” feature. It was also noted that the site was previously occupied by several structures and a paved parking area, but now exists as a vacant lot with a suspected mantling of undocumented fill soils. For the purposes of this investigation, we have assumed that the concrete slabs will be relatively lightly loaded.

3.0 METHODS OF STUDY

3.1 FIELD INVESTIGATION

As part of this investigation, subsurface soil conditions were explored by advancing three exploratory boreholes to a depth of 11½ feet below the site grade as it existed at the time of our investigation. The approximate locations of the explorations are shown on the *Exploration Location Map*, Plate A-2 in Appendix A. Exploration points were selected to provide a representative cross section of the subsurface soil conditions in the anticipated vicinity of the proposed structures. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by a qualified geotechnical engineer and are presented on the enclosed Borehole Logs, Plates B-1 through B-3 in Appendix B. A *Key to USCS Soil Symbols and Terminology* is presented on Plate B-4.

The boreholes were advanced by a CME-550 truck-mounted drill rig equipped with 6-inch hollow stem augers. Disturbed and undisturbed samples were obtained from each of the borehole explorations. Disturbed soil samples were obtained with use of a standard split spoon sampler as well as through the collection of borehole cuttings. Undisturbed samples were collected from brass liners in a Dames and Moore Split Spoon Sampler and 3-inch Shelby tubes. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Borehole Logs.

3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on selected soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Grain Size Distribution Analysis (ASTM D422)
- Atterberg Limits Test (ASTM D4318)
- 1-D Consolidation Test (ASTM D2435)
- California Bearing Ratio (AASHTO T 193)

The results of laboratory tests are presented on the test pit logs in Appendix B (Plates B-1 to B-3), the Lab Summary Report (Plate C-1), and on the test result plates presented in Appendix C (Plates C-2 through C-5).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our investigation the subject property existed as a vacant lot overlain by a road base material. No man-made improvements were observed during our investigation. The site is relatively flat throughout, having a maximum topographic relief of approximately 2 feet.

Based on information provided by the Client, as well as through the inspection of historical aerial photography, the site has previously been occupied by paved parking areas as well as a fire station which was removed from the site between 2013 and 2015. The property is bound to the northwest by landscaped recreational areas, to the northeast by a parking area, to the southwest by Holladay Boulevard, and to the southeast by commercial property.

4.2 SUBSURFACE CONDITIONS

As previously discussed, the subsurface soil conditions were explored at the site by advancing 3 borehole explorations at representative locations within the subject property. The boreholes extended to depths of 11½ feet below the existing site grade. The soils encountered in the borehole explorations were visually classified and logged during our field investigation and are included on the test pit and boring logs in Appendix B (Plates B-1 to B-3). The subsurface conditions encountered during our investigation are discussed below.

4.2.1 Soils

Based on our observations and geologic literature review, the subject site is overlain by 1 to 1½ feet of road base composed of Poorly Graded GRAVEL (GP-GM) with silt and sand. Underlying the road base, we encountered undocumented fill soils that extended to depths ranging from 7½ feet to 10 feet below the existing site grade. Where observed, the undocumented fill soils consisted of Silty SAND (SM) with gravel. Underlying the undocumented fill soils, we encountered deposits that are mapped by McKean (2020) as consisting of Pleistocene-aged lacustrine silt and clay deposits associated with the high stand of the Bonneville lake cycle. Where observed, these deposits consisted of medium stiff to soft, moist, light brown, Lean CLAY (CL) and Silty Lean CLAY (CL-ML) and persisted to the full depth of the explorations (11½ feet).

The stratification lines shown on the enclosed borehole logs represent the approximate boundary between soil types (Plates B-1 to B-3). The actual in-situ transition may be gradual. Due to the nature and depositional characteristics of the native soils, care should be taken in interpolating subsurface conditions between and beyond the exploration locations.

4.2.2 Groundwater

Groundwater was not encountered in any of the boreholes advanced as part of our investigation. Based on the location of the subject property, it is anticipated that groundwater at the site will be located relatively deep (greater than 20 feet). Seasonal fluctuations in precipitation, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to raise several feet seasonally depending on the time of year and potentially during the irrigation season. However, it is not anticipated that groundwater will impact the proposed development.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

The site is located at an elevation ranging from 4,471 feet 4,473 feet above mean sea level within the eastern portion of the Salt Lake Valley. The Salt Lake Valley is a deep, sediment-filled structural basin of Cenozoic age flanked by the Wasatch Range to the east and the Oquirrh Mountains to the west. The northwestern boundary of the Salt Lake Valley is bounded by southeastern shore of the Great Salt Lake (Hintze, 1980). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Salt Lake Valley is dominated by sediments deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983). As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valleys are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Surface sediments at the project site are mapped as Pleistocene-aged lacustrine silt and sand deposits associated with the high stand of the Bonneville lake cycle (McKean, 2020).

5.2 FAULTING AND SEISMICITY

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black and others, 2003, and Machette, 1992). The site is located approximately ½ mile southeast of the nearest mapped segment of the Salt Lake City segment of the Wasatch Fault Zone, which is mapped along the western flank of the Wasatch Mountains and the Salt Lake Salient. The Salt Lake City segment of the Wasatch Fault Zone was reportedly last active approximately 1,800 years ago and has a recurrence interval of approximately 2,400 years (Black et. al., 1996, Black et. al., 2003).

The site is located approximately 5¾ miles east of the nearest mapped exposure of the Taylorsville fault. The Taylorsville fault is one of two main splays of the West Valley fault zone

(Keaton and Curry, 1993). The West Valley fault zone trends in a north-south orientation and is located in the central portion of the Salt Lake Valley. While the West Valley fault zone is reported to be active and probably seismically independent of the Wasatch fault zone, sympathetic movement on the West Valley fault zone resulting from major earthquakes on the Wasatch fault zone Salt Lake City segment of the Wasatch fault zone is a possibility. Each of the faults listed above show evidence of Holocene-aged movement and is therefore considered active.

Spectral responses for the Risk-Targeted Maximum Considered Earthquake (MCE_R) are shown in the table below. These values generally correspond to a one percent probability of structure collapse in 50 years for a “firm rock” site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field exploration to 11½ feet, it is our opinion that this location is best described as a Site Class D (default). The spectral accelerations are calculated based on the site’s approximate latitude and longitude of 40.6701° and -111.8252° respectively and the Seismic Design Maps web-based application at <https://seismicmaps.org/>.

Description	Value
Site Class	D (default)
S_s - MCE_R ground motion (period – 0.2s)	1.346
S_1 - MCE_R ground motion (period – 1.0s)	0.494
F_a - Site amplification factor at 1.0s	1.200
F_v - Site amplification factor at 1.0s	1.806
PGA - MCE_G peak ground acceleration	0.610
PGA_M – Site modified peak ground acceleration	0.732

It should be noted that our investigation did not include a site-specific ground motion hazard analysis and a Site Class D (default) has been used to determine the seismic parameters presented above based on SPT blowcount and seismic shear wave velocity correlations (Wair et al, 2012) to the maximum depths explored of 11½ feet. The seismic parameters presented herein may be used for design of the proposed structures provided that structural design allows for the ground motion hazard analysis exception in ASCE 7-16 Section 11.4.8. Alternatively, GeoStrata may be contacted to complete a ground motion hazard analysis in accordance with ASCE 7-16 Chapter 21.

5.3 LIQUEFACTION

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Based on our review of the *Liquefaction Special Study Areas, Wasatch Front and Nearby Areas, Utah*, the site is located in an area currently designated as having a “Very Low” liquefaction potential. “Very Low” liquefaction potential indicates that the area has less than a 5 percent probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction. The near-surface soils observed within our boreholes consisted of fine-grained soils and coarse-grained sands and gravels. Groundwater was observed to be at depths greater than the depth explored in our field investigations (11½ feet). As such, it is not anticipated that liquefaction will significantly impact the subject property. A liquefaction analysis was beyond the scope of the project; however, if the owner wishes to have greater understanding of the liquefaction potential of the soils at greater depths, a liquefaction analysis should be completed at the site.

6.0 ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Supporting data upon which the following recommendations are based have been presented in the previous sections of this report. The recommendations presented herein are governed by the physical properties of the earth materials encountered and tested as part of our subsurface exploration and the anticipated design data discussed in the **PROJECT DESCRIPTION** section. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, GeoStrata must be informed so that our recommendations can be reviewed and revised as changes or conditions may require.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development provided that the recommendations contained in this report are incorporated into the design and construction of the project.

6.2 EARTHWORK

Prior to the placement of foundations or slabs on grade, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, and concrete slab-on-grade. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential settlement of foundations as a result of variations in subgrade moisture conditions.

6.2.1 General Site Preparation and Grading

Within areas to be graded (below proposed structures, fill sections, or concrete flatwork), any existing vegetation, topsoil, undocumented fill, debris, or otherwise unsuitable soils should be removed. Any soft, loose, or disturbed soils should also be removed. If over-excavation is required, the excavation should extend a minimum of one foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. Following the removal of vegetation, topsoil, undocumented fill, unsuitable soils, and loose or disturbed soils, as described above, site grading may be conducted to bring the site to design elevations.

Based on our understanding of the project, as well as the relatively thick layer of undocumented fill soils encountered at the subject site, the possibility exists that it may not be feasible to remove the entirety of the undocumented fill soils from all areas underlying the proposed concrete slabs. As a minimum, in the areas of the proposed skate park (i.e. concrete slabs not subjected to vehicle loading), it is recommended that the upper 12 inches of the undocumented fill soils be over-excavated and recompact as structural fill using the recommendations provided in Section 6.2.4 of this report. The concrete slabs may then be founded on a gravel layer as described in Section 6.4, which in turn has been established on the minimum of 12 inches of structural fill.

In areas where the concrete slabs are anticipated to experience vehicle loading (i.e. parking and access roadways), it is recommended that the upper 24 inches of the undocumented fill soils be over-excavated and recompact as structural fill using the recommendations provided in Section 6.2.4 of this report. The pavement section provided in Section 6.7 of this report may then be constructed on the 24 inches of structural fill.

The Client should be aware that by leaving any undocumented fill soils under the proposed improvements, there is an increased risk of excessive settlement of slabs and/or shortened lifespan of the concrete. The only way to eliminate this risk is to completely over-excavate and replace the undocumented fill soils with structural fill.

6.2.2 Excavation Stability

Based on Occupational Safety and Health Administration (OSHA) guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied, however, the presence of fill soils, loose soils, or wet soils may require that the walls be flattened to maintain safe working conditions. When the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Based on our soil observations, laboratory testing, and OSHA guidelines, native soils at the site classify as Type C soils. Deeper excavations, if required, should be constructed with side slopes no steeper than one and one-half horizontal to one vertical (1.5H:1V). If wet conditions are encountered (not anticipated), side slopes will likely need to be further flattened to maintain slope stability. Alternatively, shoring or trench boxes may be used to improve safe work conditions in trenches. The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering

analysis in accordance with OSHA regulations, GeoStrata can respond and provide recommendations as needed.

We recommend that a GeoStrata representative be on-site during all excavations to assess the exposed foundation soils. We also recommend that the Geotechnical Engineer be allowed to review the grading plans when they are prepared in order to evaluate their compatibility with these recommendations.

6.2.3 Soft Soil Stabilization

Although not anticipated based on observations during our field investigation, soft or pumping soils may be exposed in excavations at the site. **Once exposed, all subgrade surfaces beneath proposed pavements and flat work concrete should be proof rolled with heavy wheeled-construction equipment.** If soft or pumping soils are encountered, these soils should be stabilized prior to construction of footings. Stabilization of the subgrade soils can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 2-inch diameter, but less than 6 inches. A locally available pit-run gravel may be suitable but should contain a high percentage of particles larger than 2 inches and have less than 7 percent fines (material passing the No. 200 sieve). A pit-run gravel may not be as effective as a coarse, angular material in stabilizing the soft soils and may require more material and greater effort. The stabilization material should be worked (pushed) into the soft subgrade soils until a firm relatively unyielding surface is established. Once a firm, relatively unyielding surface is achieved, the area may be brought to final design grade using structural fill.

In large areas of soft subgrade soils, stabilization of the subgrade may not be practical using the method outlined above. In these areas it may be more economical to place a woven geotextile fabric against the soft soils covered by 18 inches of coarse, sub-rounded to rounded material over the woven geotextile. An inexpensive non-woven geotextile “filter” fabric should also be placed over the top of the coarse, sub-rounded to rounded fill prior to placing structural fill or pavement section soils to reduce infiltration of fines from above. The woven geotextile should be Mirafi RS280i or prior approved equivalent. The filter fabric should consist of a Mirafi 140N, or equivalent as approved by the Geotechnical Engineer.

6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, concrete flatwork or pavements should consist of structural fill. Structural fill may consist of reworked native silt and clay soils; however, the contractor should be aware that it can be difficult to moisture condition and compact these soils to the specified maximum density. Existing, onsite undocumented fill soils may likewise be utilized as structural fill provided it is first screened for debris, rubbish, and clasts exceeding 4-inches in diameter.

It should be noted that due to potential contamination sites located in somewhat close proximity to the site, samples of the undocumented fill soils were tested for diesel range organics (DRO), gasoline range organics (GRO), and the dry cleaning solvent PCE. Results of that testing are presented in later sections of this report.

Alternatively, an imported fill meeting the specifications below may be used. Imported structural fill should be a relatively well graded granular soil with a maximum of 50 percent passing the No. 4 mesh sieve and a maximum fines content (minus No.200 mesh sieve) of 25 percent. Clay and silt particles in imported structural fill should have a liquid limit less than 35 and a plasticity index less than 15 based on the Atterberg Limit's test (ASTM D-4318).

As an another alternatively, an imported clean gravel in conjunction with a separation fabric may be used. The clean fill should be an angular gravel with less than 1-inch in diameter and a maximum fines content (minus No.200 mesh sieve) of 5 percent. The separation fabric should be placed between the native soils and the clean gravel fill and should consist of Mirafi 140N or equivalent.

Regardless if the structural fill is imported or native, all structural fill should be free of vegetation, debris or frozen material, and should contain no inert materials larger than 4 inches nominal size. All structural fill soils should be approved by the Geotechnical Engineer prior to placement. Soils not meeting the aforementioned criteria may be suitable for use as structural fill. These soils should be evaluated on a case-by-case basis and should be approved by the Geotechnical Engineer prior to use. The contractor should anticipate testing all soils used as structural fill frequently to assess the maximum dry density, fines content, and moisture content, etc.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 12-inch loose lifts if compacted by light-duty rollers, and heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by the geotechnical engineer. Structural fill should be compacted to at least 95% of the maximum dry density, as determined by ASTM D-1557. The moisture content should be at or slightly above the optimum moisture content at the time of placement and compaction. Also, prior to placing any fill, the excavations should be observed by the geotechnical engineer to observe that any unsuitable materials or loose soils have been removed. In addition, proper grading should precede placement of fill, as described in the **General Site Preparation and Grading** subsection of this report (Section 6.2.1).

Fill soils placed for subgrade below exterior flat work and pavements, should be within 3% of the optimum moisture content when placed and compacted to at least 95% of the maximum dry density as determined by ASTM D-1557. All utility trenches backfilled below the proposed structure, pavements, and flatwork concrete, should be backfilled with structural fill that is within 3% of the optimum moisture content when placed and compacted to at least 95% of the maximum dry density as determined by ASTM D-1557. All other trenches, in landscape areas, should be backfilled and compacted to at least 90% of the maximum dry density (ASTM D-1557).

The gradation, placement, moisture, and compaction recommendations contained in this section meet our minimum requirements but may not meet the requirements of other governing agencies such as city, county, or state entities. If their requirements exceed our recommendations, their specifications should override those presented in this report.

6.3 FOUNDATIONS

While not anticipated, any structures requiring footings should be founded on foundation systems consisting of conventional strip and/or spread footings. Strip and spread footings should be a minimum of 20 and 36 inches wide, respectively, and exterior shallow footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior shallow footings not susceptible to frost conditions should be embedded at least 18 inches for confinement.

6.3.1 Installation and Bearing Material

If foundations are necessary, we recommend that all undocumented fill soils present under the footings be over-excavated until native soils are encountered. The site may then be brought back up to design grade using properly placed and compacted structural fill meeting material recommendations and be placed and compacted as recommended in Section 6.2.4.

6.3.2 Bearing Pressure

Conventional strip and spread footings founded as described above may be proportioned for a maximum net allowable bearing capacity of **1,600 pounds per square foot (psf)**. The recommended net allowable bearing pressure refers to the total dead load and can be increased by 1/3 to include the sum of all loads including wind and seismic.

6.3.3 Settlement

Settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

6.3.4 Frost Depth

All exterior footings are to be constructed at least 30 inches below the ground surface for frost protection and confinement. This includes walk-out areas and may require fill to be placed around buildings. Interior footings not susceptible to frost conditions should be embedded at least 18 inches for confinement. If foundations are constructed through the winter months, all soils on which footings will bear shall be protected from freezing.

6.3.5 Construction Observation

A geotechnical engineer shall periodically monitor excavations prior to installation of footings. Inspection of soil before placement of structural fill or concrete is required to detect any field conditions not encountered in the investigation which would alter the recommendations of this report. All structural fill material shall be tested under the direction of a geotechnical engineer for material and compaction requirements. Lot specific collapse testing should be completed at the time of the foundation excavation in order to observe whether collapsible soils underlie the proposed residences.

6.4 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Due to the presence of relatively thick undocumented fill soils at the subject property, any concrete slabs founded on these soils have an elevated potential of requiring additional maintenance due to excess settlement over the lifespan of the facility. The only way to eliminate this potential is to over-excavate the fill soils until native soils are encountered and bring the site back up to design grade using properly placed and compacted structural fill. GeoStrata understands that it may not be economically feasible to over-excavate the undocumented fill soils, and as such the following recommendations are provided to reduce the potential for premature distress to the slabs associated with the project.

Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying a zone of structural fill that is at least 12 inches thick. Structural fill should be compacted to at least 95% of the maximum dry density as determined by ASTM D-1557 (modified proctor) prior to placement of gravel. The gravel should consist of road base or clean drain rock with a $\frac{3}{4}$ -inch maximum particle size and no more than 12 percent fines passing the No. 200 mesh sieve. The gravel layer should be compacted to at least 95 percent of the maximum dry density of modified proctor or until tight and relatively unyielding if the material is non-proctorable. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with welded wire, re-bar, or fiber mesh.

If the concrete slabs experience excess settlement it is likely that and offset slabs will require leveling through the application of an expansive foam or low-strength pumping grout into any voids.

6.5 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance against concrete, a coefficient of friction of 0.35 should be used for fine-grained structural fill against concrete. A coefficient of friction of 0.44 should be used for coarse-grained structural fill against concrete.

Ultimate lateral earth pressures from native fine-grained material acting against buried walls and structures for long term condition may be computed from the lateral pressure coefficients or equivalent fluid densities presented in the following table:

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pounds per cubic foot)
Active ¹	0.28	33
At-rest ²	0.47	56
Passive ¹	7.33	880
Seismic Active ³	0.34	41
Seismic Passive ⁴	-4.41	-530

1. Based on Coulomb's equation
2. Based on Jaky
3. Based on Lew et al. (2010)
4. Based on Mononobe-Okabe Equation

These coefficients and densities assume level, granular backfill with no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. If sloping backfill is present, we recommend the geotechnical engineer be consulted to provide more accurate lateral pressure parameters once the design geometry is established.

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation, the at-rest condition should be used. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by $\frac{1}{2}$.

For seismic analyses, the *active* and *passive* earth pressure coefficient provided in the table is based on the Mononobe-Okabe pseudo-static approach and only accounts for the dynamic horizontal thrust produced by ground motion. Hence, the resulting dynamic thrust pressure *should be added* to the static pressure to determine the total pressure on the wall. The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients shown assume a vertical wall face. Hydrostatic and surcharge loadings, if any, should be added. Over-compaction behind walls should be avoided. Resisting passive earth pressure from soils subject to frost or heave, or otherwise above prescribed minimum depths of embedment, should usually be neglected in design.

6.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

Moisture should not be allowed to infiltrate the soils in the vicinity of the slabs. This is particularly imperative due to the presence of undocumented fill overlaying the site. Where practicable, all runoff should be directed towards the edges of the concrete slabs and into collection gutters that direct the storm water away from the underlying fill soils. It is not recommended that storm drain sumps be used as part of this development. Finally, we recommend that irrigation near the skate park be limited, with irrigation valves being maintained a minimum of 5 feet away from the slabs. Areas of pooling water should be avoided.

6.7 PAVEMENT SECTION

For pavement design, the following CBR laboratory test result was obtained:

Test Pit	Depth (ft)	Soil Type	CBR (%)
B-1	7.5	CL	8.5

No traffic information was available at the time this report was prepared; therefore, GeoStrata has assumed traffic counts for the parking lot and the access roadway to the site. We assumed that vehicle traffic along the local and private roadways will consist of approximately 200 passenger car trips per day and 1 small truck per day assuming a 20-year design life. Based on these assumptions, our analysis uses 21,000 ESAL's for the traffic over the life of the pavement.

We understand that it is planned to utilize rigid (concrete) pavements in all parking and access roadway areas associated with this project. As such, the following rigid pavement section is recommended:

Rigid Pavement Section	
Concrete (in)	Untreated Base Course (in)
5	6

As mentioned previously, Due to the presence of relatively thick undocumented fill soils underlying the subject property, there is an increased potential for the slabs to experience premature distress and/or require occasional maintenance if these soils are left in place. The only way to eliminate this potential is to over-excavate the fill soils until native soils are encountered and bring the site back up to design grade using properly placed and compacted structural fill. If the undocumented fill soils are left in place in areas underlying the slabs subjected to vehicle loadings, the pavement section above should be founded on a minimum of 24-inches of properly placed and compacted structural fill soils as outlined in Section 6.2.4 of this report. Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the MDD as determined by the ASTM D-1557. Our concrete design assumes that load transfer components will be incorporated into the design of the concrete.

The pavement section thicknesses above assume that there is no mixing over time between the road base and the softer native layers below. In order to prevent mixing or fines migration, and thereby prolong the life of the pavement section, we recommend that the owner give consideration to placing a non-woven filter fabric between the 24-inches of structural fill and the road base. We recommend that a Propex Geotex® NW-401, NW-601, or a GeoStrata-approved equivalent be used.

If traffic conditions vary significantly from our stated assumptions, GeoStrata should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to review the pavement sections as necessary. The pavement sections thickness above assumes that the majority of construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed, the owner should anticipate maintenance or a decrease in the design life of the pavement area.

The pavement sections discussed above meet our minimum recommendations for pavement design. It should be noted that more stringent pavement section requirements may be enforced by Holladay City or other governing agency.

6.8 POTENTIAL ENVIRONMENTAL CONCERNS

As discussed previously, concerns were raised that the undocumented fill soils present at the subject site may have been impacted by environmental contamination due to activities on

neighboring and upgradient properties. As a response, a soil sample obtained from the site was tested for three potential contaminants.

1. Diesel Range Organics (DRO)
2. Gasoline Range Organics (GRO)
3. PCE (dry-cleaner solvents)

Based on the results of our testing, the sample tested did not contain significant concentrations of GRO and PCE. However, a measured concentration of 41.9 ppm of DRO were detected. This value falls far below the DOGM cleanup standard of 500 ppm for residential properties, and as such it is unlikely that this level of contamination poses a significant hazard at the site considering the fact that the majority of the site will be capped with concrete and landscape related topsoil.

It should be noted that our testing was not all-inclusive of all potential contaminants that may exist at the subject property. Our testing was limited to the request of the Client. It is possible that concentrations greater than those measured may be present at the subject site. If the Client desires to have a greater understanding of the nature of any contamination at the site, a Phase I/II ESA investigation should be completed.

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our limited field exploration, laboratory testing, and understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, GeoStrata should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. GeoStrata staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following.

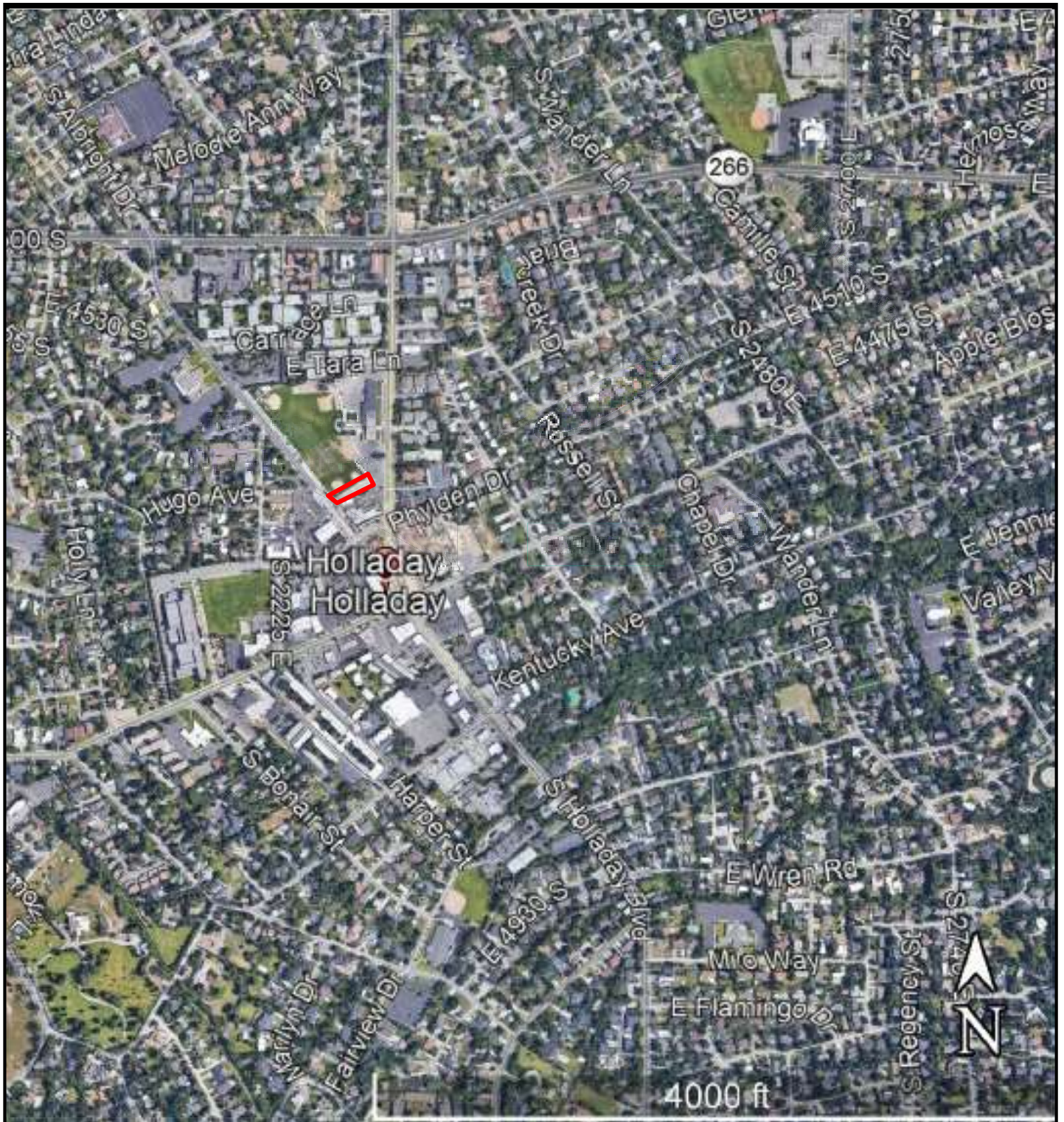
- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.
- Quality control and observation of concrete placement.

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 501-0583.

8.0 REFERENCES CITED

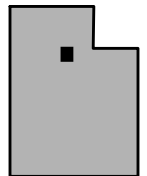
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Base Maps:
 Google Earth –
 Utah AGRC Hybrid Base Map



Site Boundary Location



MAP LOCATION

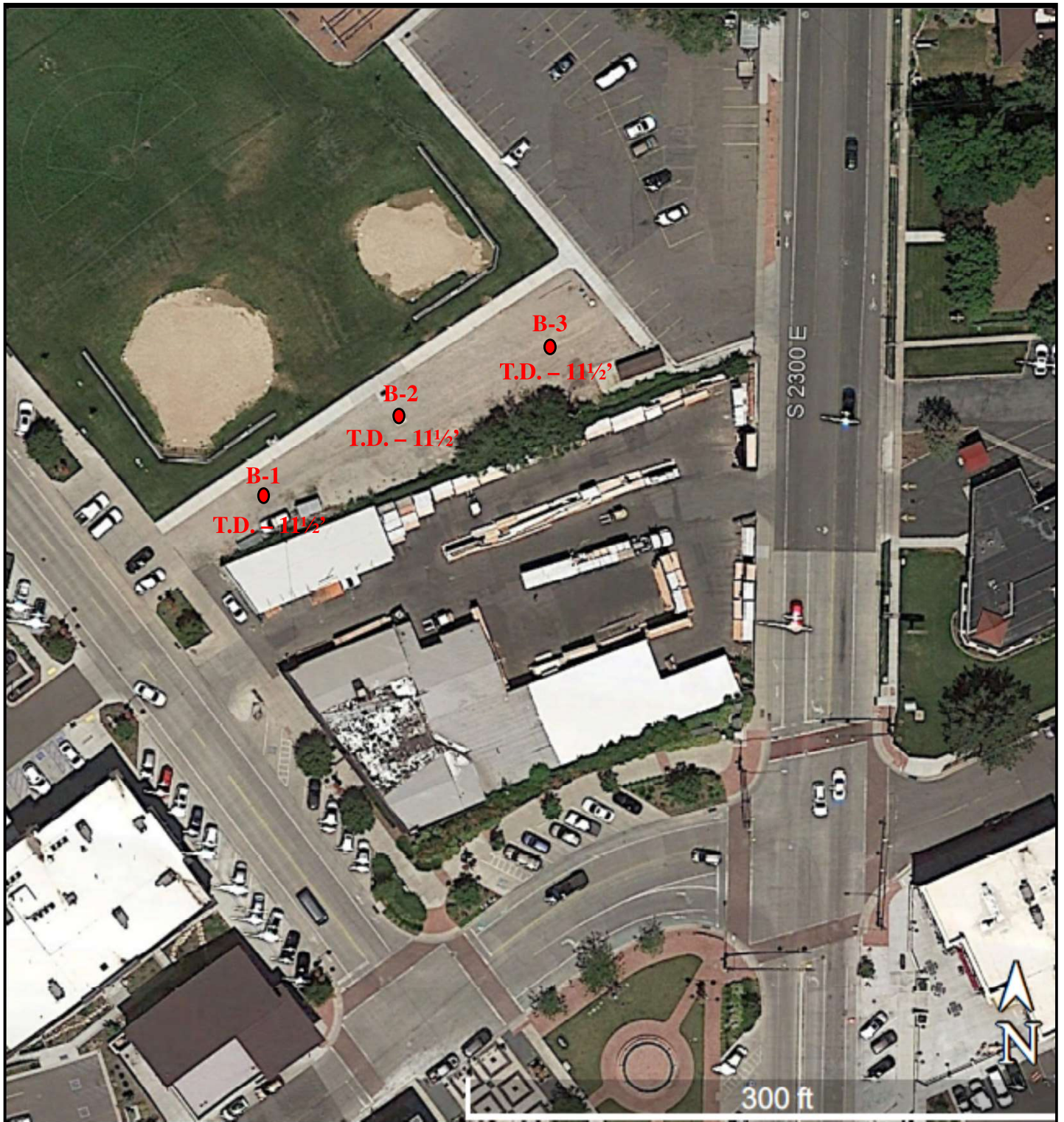
GeoStrata
 Copyright GeoStrata, 2020

Holladay City
 Holladay City Skate Park
 2300 East Holladay Boulevard
 Holladay, Utah

Project Number 1338-002

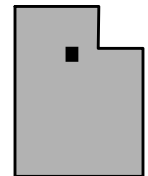
SITE VICINITY MAP

**Plate
 A-1**



Base Maps:
 Google Earth –
 Utah AGRC Hybrid Base Map

● Borehole Location and Total Depth



MAP LOCATION

GeoStrata
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Holladay City
 Holladay City Skate Park
 2300 East Holladay Boulevard
 Holladay, Utah

Project Number 1338-002

Exploration Location Map

**Plate
 A-2**

[illegible]

Plate
B - 1

[illegible]

SAMPLE TYPE

NOTES:

WATER LEVEL

DATE		STARTED: 10/13/20		COMPLETED: 10/13/20		BACKFILLED: 10/13/20		Holladay City Skate Park 2300 East Holladay Boulevard Holladay City, Utah		GeoStrata Rep: JRS Rig Type: CME-75 Boring Type: HSA		Boring ID B-3 Sheet 1 of 1			
DEPTH		EASTING		NORTHING		ELEVATION		LOCATION		Moisture Content and Atterberg Limits					
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	
										Plastic Limit		Moisture Content		Liquid Limit	
										10 20 30 40 50 60 70 80 90		10 20 30 40 50 60 70 80 90		10 20 30 40 50 60 70 80 90	
0	0					ROADBASE - Poorly Graded GRAVEL (GP) with sand									
					GM	UNDOCUMENTED FILL; Silty GRAVEL with sand - medium dense, moist, light brown									
1	0						49			118.7	5.5	19.5	20	3	
	5						17								
2						UNDOCUMENTED FILL; Silty Clayey GRAVEL with sand (GM-GC) - medium dense, moist, light brown									
							15			107.6	5.4				
3	10				CL	Lean CLAY - stiff, moist, brown to gray									
							5			103.3	4.9				
4						Bottom of Boring @ 11.5 Feet									

N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT



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SAMPLE TYPE

-  2" O.D./1.38" I.D. Split Spoon Sampler
-  2.5" O.D./2" I.D. California Split Spoon Sampler
-  3" O.D. Thin-Walled Shelby Sampler
-  Grab Sample
-  2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL

▼ - MEASURED ▽ - ESTIMATED

Plate
B - 3

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
		SANDS WITH OVER 12% FINES	SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)	ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY	
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS (Liquid limit greater than 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY	
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNTRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

LOG KEY SYMBOLS

	BORING SAMPLE LOCATION		TEST-PIT SAMPLE LOCATION
	WATER LEVEL (level after completion)		WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.



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Soil Symbols Description Key

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Boring No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Natural Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Gradation			Atterberg		CBR (%)
							Gravel (%)	Sand (%)	Fines (%)	LL	PI	
B-1	2.5	SM	8.7				15.0	34.9	50.1	23	8	
B-1	5	SP	4.7	109			34.2	61.2	4.6	NP	NP	
B-1	7.5	CL	1.9	114.1	9	129	10.0	25.1	64.9	23	7	8.5
B-1	10	CL	21				3.2	5.6	91.2	28	8	
B-2	2.5	SC-SM	9.6				28.6	39.0	32.4	23	7	
B-2	5	GP-GC	14.5	115.2					67.5			
B-2	7.5	GP-GC	17.2	118.7					64.7	27	9	
B-3	2.5	GM	5.5	118.7			40.7	39.8	19.5	20	3	
B-3	7.5	GC-GM	5.4	107.6								
B-3	10	CL	4.9	103.3								

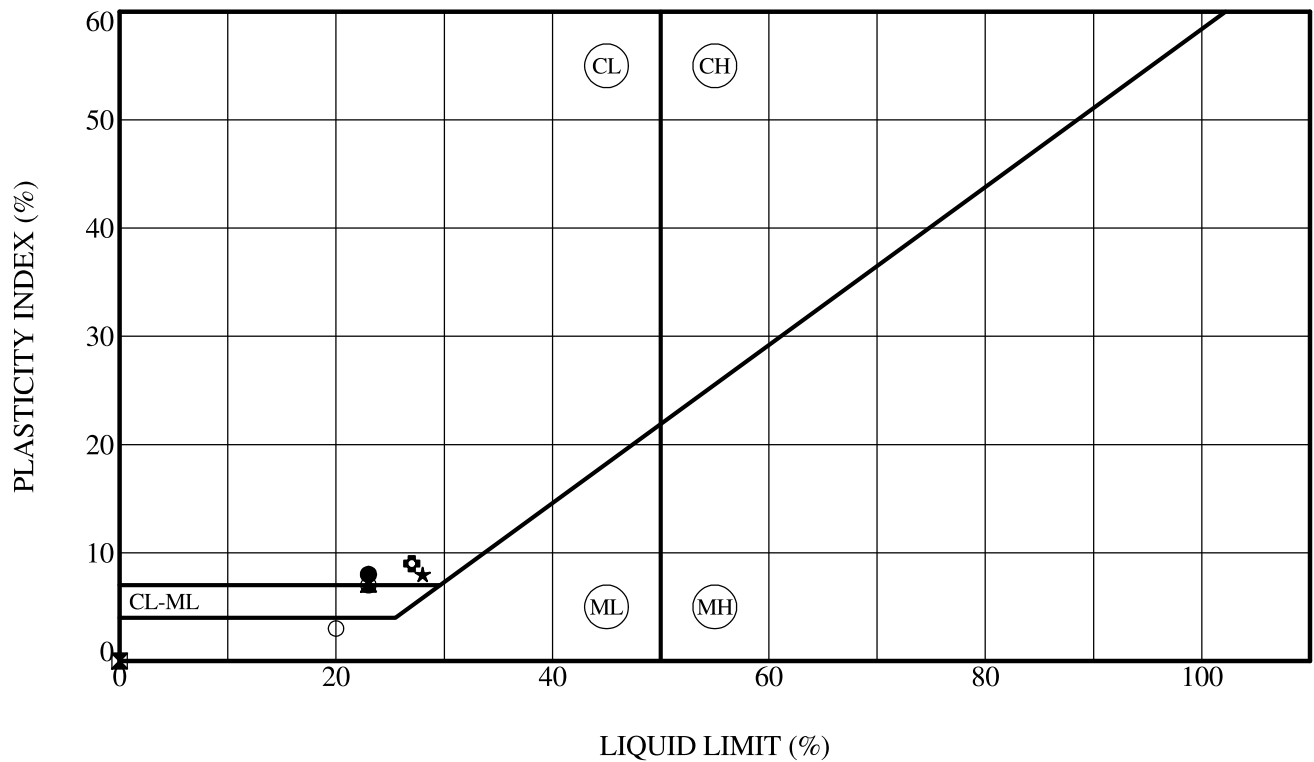


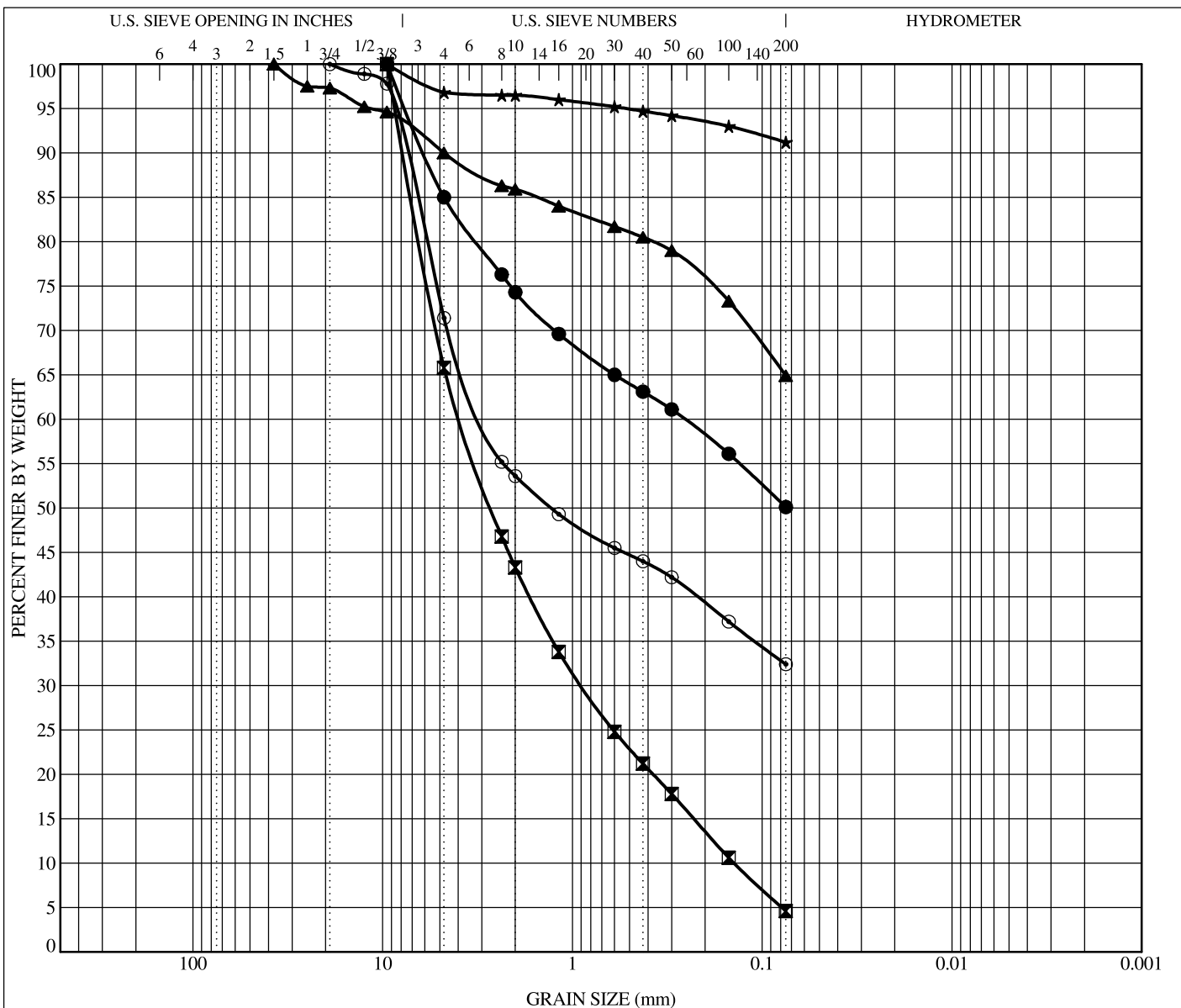
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Lab Summary Report

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**Plate
C - 1**

[illegible]



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

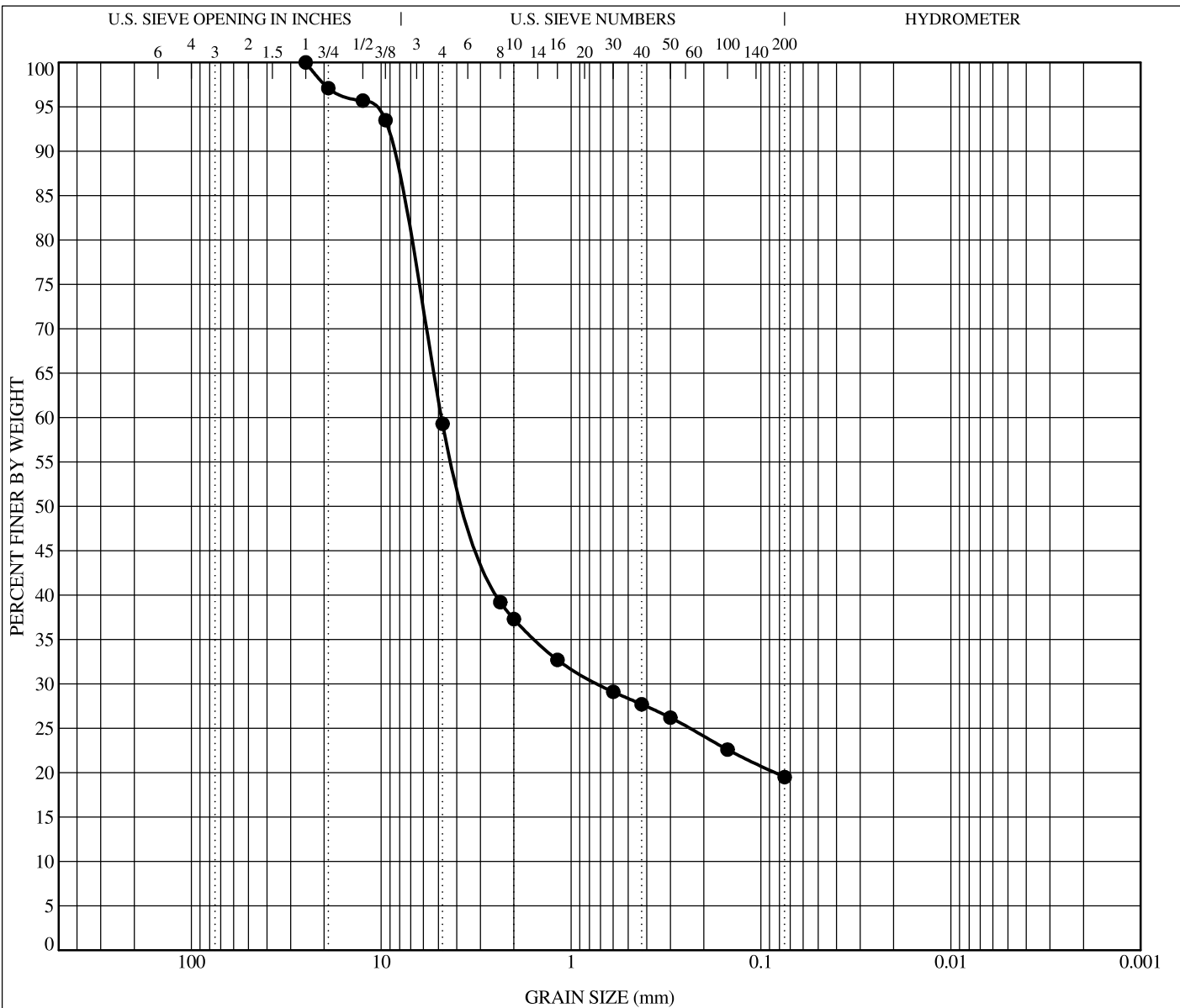
Sample Location		Depth	Classification					LL	PL	PI	Cc	Cu
●	B-1	2.5	Sandy Silty CLAY with gravel					23	15	8		
▣	B-1	5.0	Poorly Graded SAND with gravel					NP	NP	NP	1.46	27.41
▲	B-1	7.5	Sandy Lean CLAY					23	16	7		
★	B-1	10.0	Lean CLAY					28	20	8		
⊙	B-2	2.0	Silty Clayey SAND with gravel					23	16	7		
Sample Locaion		Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	B-1	2.5	9.5	0.258			15.0	34.9	50.1			
▣	B-1	5.0	9.5	3.837	0.887	0.14	34.2	61.2	4.6			
▲	B-1	7.5	37.5				10.0	25.1	64.9			
★	B-1	10.0	9.5				3.2	5.6	91.2			
⊙	B-2	2.0	19	2.903			28.6	39.0	32.4			

GRAIN SIZE DISTRIBUTION - ASTM D422

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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Location	Depth	Classification					LL	PL	PI	Cc	Cu
● B-3	2.5	Silty GRAVEL with sand					20	17	3		

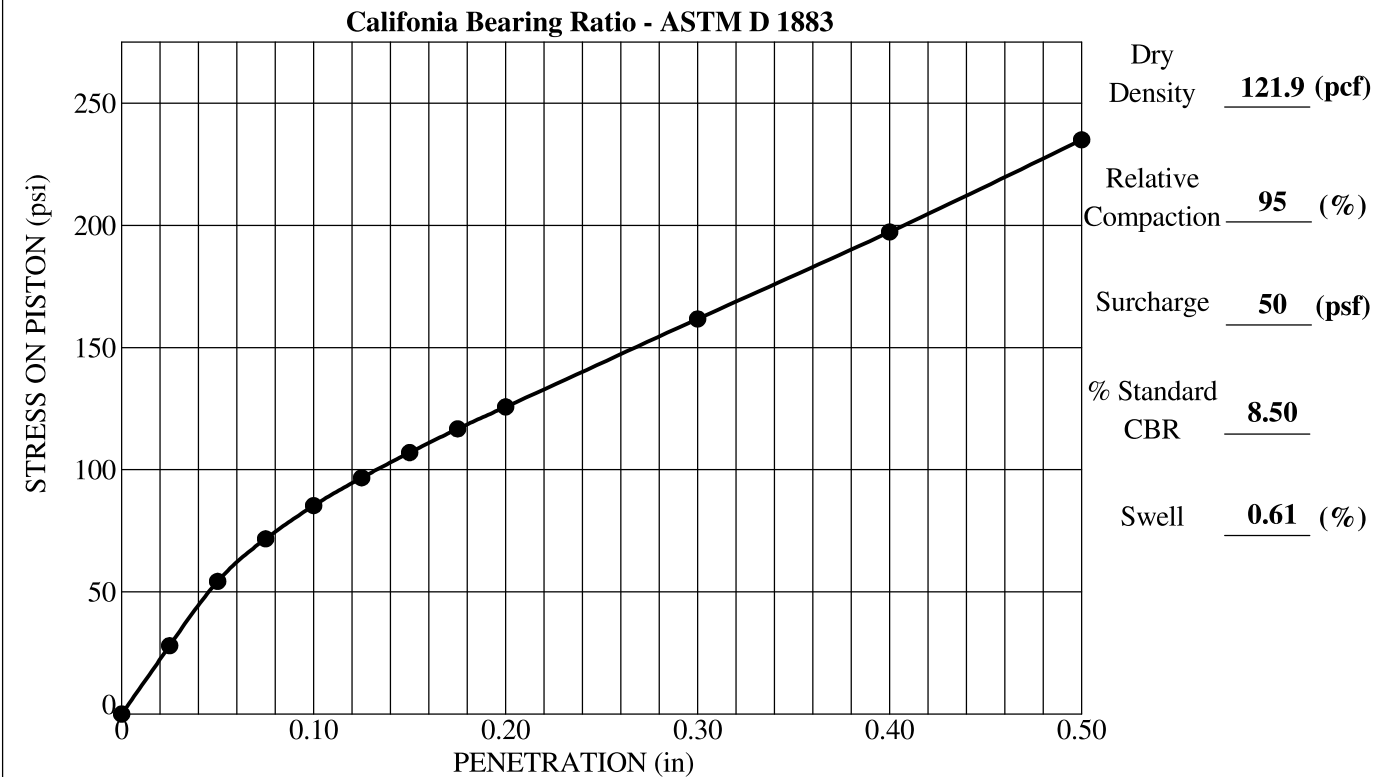
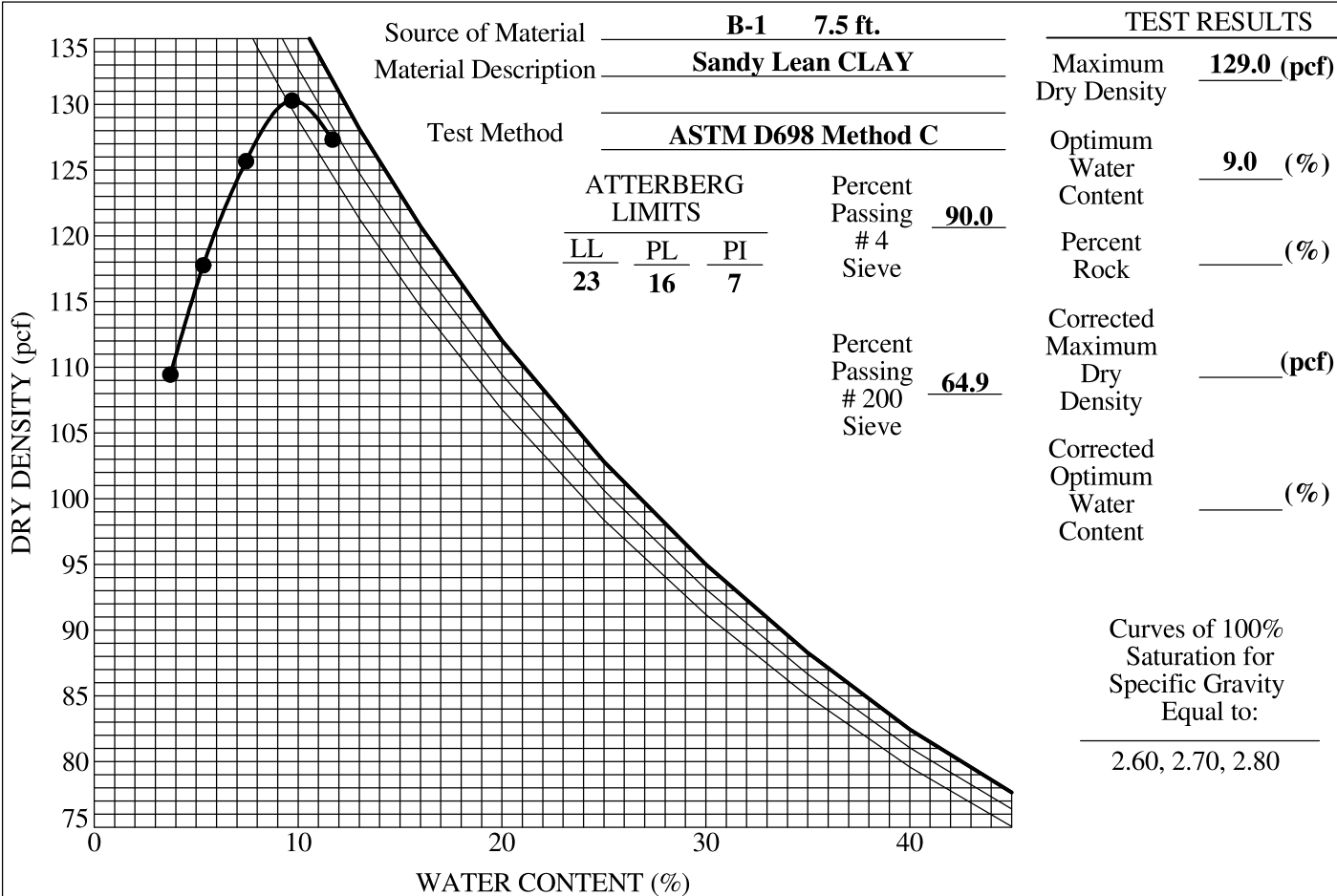
Sample Location	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-3	2.5	25	4.818	0.711		40.7	39.8	19.5	

GRAIN SIZE DISTRIBUTION - ASTM D422



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COMPACTION AND CBR TEST

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Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared solely for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions, new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are *not* final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

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Plate
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