ABCO ENGINEERING

Geotechnical Investigation

Odyssey Flats Tibbs Condos

1715 Idaho Street

Boise, Idaho

January 13, 2020

Geotechnical Investigation

Odyssey Flats Tibbs Condos

Boise, Idaho

Prepared For:
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APPENDICES

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

ABCO Engineering (ABCO) has performed our geotechnical engineering evaluation for the proposed Odyssey Flats Tibbs Condos project located at 1715 Idaho Street in Boise, Idaho. A vicinity map showing the site location is included as Figure 1, Appendix A.

The project site is currently an undeveloped 18,300 SF lot consisting of three addresses 1715, 1711 and 1709 that will be combined into one lot by others. A northeastern portion of the existing lot is currently covered by 2-inches of asphalt. The remainder of the property is flat undeveloped ground. Historic images provided by Google Earth show the property covered by construction in the past. No details regarding the previous construction were available at the time of this report.

We understand the project will consist of the design and construction of a 3-story slab-on-grade wood framed condominium. The condominium is anticipated to consist of 18 units, an elevated patio on the back and ground level covered parking in the back as well. No structural loading information was available at the time of this report. We understand a seepage bed is proposed to underlie the front green area or northeastern portion of the project. We understand the project does not include below grade construction, retaining walls or water features.

The work performed for this report was authorized on November 21, 2019, by Mark Fledderjohann with Mussell Construction, Inc. and was conducted in accordance with our site investigation proposal dated November 20, 2019.

Loose to medium dense soil conditions and undocumented fill material were both encountered within the upper 4.5 feet of the soil profile within the footprint of the proposed building. Designers and Contractors should review each section of this report carefully to make sure these observed conditions are incorporated into their respective scopes of work. Temporary shoring may be required for footing construction based on recommendations provided in this report.

1.2 SCOPE OF WORK

The purpose of our evaluation was to explore the subsurface soil conditions at the project site and prepare geotechnical recommendations to assist project planning, design and construction. This report was prepared solely for geotechnical purposes and does not address any geo-environmental issues. To accomplish our evaluation, ABCO performed the following services:

- Coordinate access to the site with you and contact Dig Line to clear utilities.
- Subcontract with Haz-Tech Drilling to observe the drilling of 3 borings (B-1, B-2, B-3) to 31.5 feet below existing grade surface (BGS). A field engineer described and classified the subsurface conditions encountered referencing ASTM D 2487, ASTM D 2488, and the Unified Soil Classification System (USCS).
- Collect disturbed split spoon samples. Soil samples were obtained for identification and laboratory testing.
- Measured infiltration rate and installed a temporary 2-inch diameter piezometer in boring B-3 at 14-feet BGS.
- Backfilled borings with spoils from the holes.
- Accomplish laboratory testing to assess characteristics of the soil encountered.

1.3 REFERENCES

The following information was provided to or used by ABCO Engineering and serves as the basis of our understanding of the project site conditions and project scope:

1. Site Plan Prepared by Network Architects dated January 7, 2019
2. Geotechnical Engineering – Foundation Design, John N Cernica, 1995
3. OSHPD Seismic Design Maps, Structural Engineers Association (SEA)
4. National Resource Conservation Services (NRCS). Web Soil Survey, 2017
5. Geotechnical Engineer's Portable Handbook, Second Edition, Robert W. Day, McGraw Hill, 2012

1.4 APPLICATION OF THIS REPORT

Appendix D contains important information relating to the role of ABCO Engineering on this project and the appropriate use of this report.

This report is intended to provide geotechnical information to the project owner and project designers. This report may be provided to the contractor as reference information but is not intended to be a substitute for properly prepared contract drawings and specifications. ABCO Engineering requests the opportunity to review final drawings and specifications for comparison with our understanding of the site conditions and project geotechnical requirements.

2 METHODS OF STUDY

2.1 GENERAL RECONNAISSANCE

ABCO Engineering reviewed the drawing prepared by Network Architects referenced in Section 1.3 to research site, determine boring spacing and identify soils data based on NRCS mapping information.

2.2 FIELD EXPLORATIONS

The subsurface soil conditions were explored by performing 3 soil borings (B-1, B-2, B-3) in the footprint of the proposed building. Borings were advanced to a depth of 31.5 feet BGS. The borings were performed utilizing a CME-75, truck-mounted drill rig using a hollow-stem auger. Soil samples were collected from the borings at selected depths by driving a 1.5 inch inside diameter (I.D.) Standard Penetration Test (SPT) sampler at selected depths with a 140-pound automatic hammer free falling a distance of 30 inches in general conformance with American Society of Testing Materials (ASTM) D1586. Resistance to sampler penetration was noted as the number of blows over each 6 inches on the boring logs.

Each soil sample was classified in general accordance with the Unified Soil Classification System (USCS) presented in ASTM D 2487 and D2488. The approximate location of the soil borings is shown on Figure 2 – Exploration Map in Appendix A. Logs of the subsurface conditions were recorded at the time of the field work by ABCO Engineering and is presented in Appendix B.

2.3 FIELD AND LABORATORY TESTING

Laboratory testing was performed on select samples collected during the field exploration to evaluate physical and engineering characteristics of the site soils. The following laboratory test was used to develop the design geotechnical parameters included in this report:

- Full Gradation with 200 Wash

3 INTERPRETATION

3.1 GEOLOGY

Studies completed by the U.S. Department of Agriculture National Resource Conservation Service (Web Soil Survey), indicate that the underlying soil consists of Urban land. No information regarding existing soil properties is available on the United States Department of Agriculture (USDA) site.

3.2 FLOODING

The likelihood of flooding of the proposed building area is not available on the NRCS site. The proposed construction should be graded to route all storm water away from the proposed construction.

3.3 SUBSURFACE PROFILE

A generalized subsurface profile was developed for this project to provide a basis for discussion of soil conditions for the proposed facilities. This profile is based on the field test data and exploration logs conducted by ABCO Engineering.

Table 1 - Generalized Subsurface Profile*

Stratum	Generalized Description
I	FILL: POORLY GRADED SAND (SP) with gravel, POORLY GRADED GRAVEL (GP-GC) with sand: Encountered between the surface and 4.5 feet BGS. Consisting of reddish brown, dark brown, black, dark gray, loose to medium dense, (N-Value = 8 to 25 blows per foot (bpf)), moist
II	NATIVE: POORLY GRADED SAND (SP) with gravel: Encountered between 4.5 and 7.0 ft BEG. Consists of light gray, loose, moist. (N-Value= 7 to 9 bpf), moist.
III	POORLY GRADED GRAVEL (GP) with sand: Encountered between 4.5 and 31.5 ft BGS, consisting of reddish brown, light brown to gray, and brown, medium dense to very dense, moist, (N-Value = 15 to 50+ bpf)

*See the logs of exploration (Appendix B) for detailed subsurface information.

3.4 UNDOCUMENTED FILL

Undocumented fill was encountered during this subsurface investigation between the surface and 4.5 feet BGS. Fill classification on site was based on the soil investigation performed. If a more precise classification of on-site fill is needed, we recommend additional field exploration, such

as excavating test pits, be performed with ABCO or the responsible engineer. Please review section 4.2.3 Subgrade Preparation for Buildings and Slab-On-Grade recommendations.

3.5 GROUNDWATER

Groundwater was encountered in borings B-1, B-2, and B-3 between 8 and 10 feet below the existing ground surface (BGS). A 2-inch diameter perforated temporary observation well was installed in boring B-3 to 14 feet BGS. The borings were backfilled at the completion of the excavation with spoils from the borings. It should be noted that groundwater levels may fluctuate seasonally in response to precipitation, land use, irrigation and other factors. We recommend the ground water elevation be monitored to be sure it does not impact proposed foundation design and construction. Groundwater control may be needed during construction if the bottom of excavation is near or below the ground water elevation. Seasonal monitoring of the groundwater fluctuation is beyond the scope of this report.

3.6 SITE GROUND MOTION

This project site is classified as Site Class D, for use with the 2012-2015 International Building Code (IBC). A more detailed report of the specific site ground motion by the Structural Engineers Association (SEA) of California can be found in Appendix C.

3.7 CORROSION POTENTIAL

The NRCS soil survey (Ref 2) did not have any information regarding the potential for soil to corrode concrete and steel. It is recommended that uncoated steel should not be placed directly on the soil.

4 RECOMMENDATIONS AND CONCLUSION

4.1 GENERAL RECOMMENDATIONS

Based on the results of our field investigations, it is our opinion that the site is suitable for the proposed construction provided the recommendations in this report are followed during design and construction. Based on field observations and test results, foundation loads may be applied to the native soils on site. Existing on-site undocumented fill and low bearing native soil should be removed prior to beginning site development. The geotechnical design recommendations presented in this section are derived from borings and laboratory test data across the site.

If any revisions in the nature, design, or location of the proposed construction are made at a later date that significantly alter the present definition of the project, the recommendations within the following sections shall be subject to review by ABCO Engineering and may be modified as deemed necessary. A review of additional information may require the need for additional subsurface exploration, laboratory testing and engineering analysis.
We recommend ABCO or the responsible Geotechnical Engineer be retained to provide construction monitoring to verify the subsurface conditions and that the report recommendations are incorporated into the actual construction. Such observation is an important part of the geotechnical design process and can help reduce the potential for soil engineering or construction related errors or omissions.

4.2 EARTHWORK

4.2.1 Erosion Potential

Land disturbance from construction activities will increase the potential for erosion. Sediment leaving a construction site is considered a pollutant by the Environmental Protection Agency (EPA). The EPA Clean Water Act requires that projects with earth disturbances greater than 1-acre in area prepare a stormwater prevention and pollution plan (SWPPP). Since the approximate earth disturbance across the proposed project site is less than 1-acre, an Erosion Sediment Control Plan (ESCP) will be required and must be prepared and submitted to the City of Boise. The preparation of an ESCP is not included in the scope of this geotechnical work.

4.2.1 Wet Weather Construction

We recommend construction be undertaken during dry weather conditions. If site preparations and grading is undertaken during wet conditions, the on-site soils will be susceptible to pumping or rutting during compaction and may prove to be difficult to work with. Wet weather earthwork should be performed by low-pressure, track-mounted equipment that spread and reduce the vehicle load. Earthwork should not be performed immediately after or until the soil has had the opportunity to dry sufficiently to allow construction traffic. All soft and disturbed soil should be excavated to undisturbed soil and backfilled with engineered fill. Compaction of engineered fill should be sufficiently controlled to avoid pumping of the underlying soil and be performed in accordance with Section 4.2.3 and 4.2.6 of this report. During wet weather, surface water should not be permitted to pond near the top or flow into excavations.

4.2.2 Temporary Excavations

Safety at the construction site is the sole responsibility of the Contractor, who selects and directs the means, methods and sequencing of the construction operations. The Contractor will need to evaluate and select appropriate construction methods and procedures that comply with the applicable local, state and federal safety regulations (including the current OSHA Excavation and Trench Safety Standards) for any temporary site excavations. The soils observed in the investigation primarily consisted of sand, silts and clays and best classify as type B and must be sloped no steeper than 1H:1V. If side slopes of excavations are steeper than OSHA criteria, they will require trench boxes or some other type of lateral support and protection.

4.2.3 Subgrade Preparation for Foundations and Slab-On-Grade

Preparation of subgrade soil for foundation placement and slab-on-grade floors should first include removal of on-site topsoil and existing undocumented fill. Our soil investigation encountered undocumented fill to approximately 4.5 feet BGS.

Temporary shoring may be required to accommodate subgrade preparation or foundation construction due to the proximity of the proposed building to the adjacent existing structures and property lines. The Contractor should be responsible for the construction means and methods including the design and construction of temporary shoring. Recommended soil parameters for temporary shoring are provided in section 4.2.4 of this report.

ABCO recommends undocumented fill and low bearing native soil, in the building footprint, be excavated out and replaced with soil improvements consisting of compacted structural fill as shown in Figure 3 in the Appendix A. Improved soil spread footings may be proportioned to bear

on native poorly graded sand (SP) with gravel with N-values on the order of 7 bpf or better encountered encountered at approximately 4.5 feet BGS. If allowable soil bearing pressures are not sufficient for the proposed structural design, footings may be prepared to bear on poorly graded gravel (GP) with sand with N-values on the order of 17 bpf or better encountered at approximately 7.0 feet BGS. Soil meeting requirements set in this report are suitable for the proposed foundations and may be utilized provided the following recommendations are followed:

1. Excavate to required footing subgrade elevation ensuring all Stratum I undocumented fill and low bearing soil below proposed footings is removed.
2. Provide compaction effort on the footing subgrade soil using a jumping jack, plate compactor, or equivalent. Any cobbles or boulders (3-inches or greater) not allowing for a smooth compaction surface should be removed and replaced with approved Structural Fill.
3. If any pumping or instability is observed during compaction and probing, over-excavate the disturbed subgrade and replace with granular structural fill as discussed in Section 4.2.6.
4. Place and compact structural fill as necessary to achieve final grades in accordance with the *Structural Fill* section of this report.
5. A separation distance of 12 inches or greater should be maintained between the subgrade elevation and top of groundwater.

The following should be performed for preparation of slab-on-grade:

1. Excavate and remove existing undocumented fill in the footprint of the slab-on-grade to 4.5 feet BGS to firm native subgrade.
2. Proof-roll the exposed compacted native subgrade soil with a minimum of 5 passes of a minimum 5-ton smooth drum or sheepsfoot roller. Any cobbles or boulders (3-inches or greater) not allowing for a smooth proof-rolling surface should be removed and replaced with approved Structural Fill.
3. If any pumping or instability is observed during proof-rolling, over-excavate the disturbed subgrade and replace with granular structural fill as discussed in Section 4.2.6.
4. Backfill to grade with structural fill according to Section 4.2.6

All building and slab-on-grade areas should be stripped of vegetation prior to construction. The finish surface of all buildings and slab-on-grade areas should be graded adequately to drain towards storm water conveyance or disposal facilities. Vegetation and topsoil may be stockpiled on the site and used as topsoil. Do not use stripped soil as general or structural fill.

4.2.4 Lateral Earth Pressure /Temporary Shoring

Backfill material for temporary shoring should be clean granular material. The soil parameters provided in Table 2 are recommended for temporary shoring for the soils encountered at the site.

Table 2 – Lateral Earth Pressures (non-submerged conditions)

Lateral Earth Pressure Case	Equivalent Fluid Pressure (EFP)
At Rest (Ko)	57 psf/ft of depth
Active (Ka)	40 psf/ft of depth
Passive (Kp)	250 psf/ft of depth

Assumed moist unit weight of in situ soil (γ): 100 pcf
Assumed angle of internal friction for in situ soil (ϕ): 25°

The earth pressure values provided in Table 2 are ultimate values and the designer should apply appropriate reduction factors for design. The lateral earth pressure values provided in Table 2 are for properly drained backfill and do not include hydrostatic pressures that can develop if groundwater or surface water is trapped behind a structure.

Over compaction behind the shoring should be avoided, as increased compaction effort can result in lateral pressures higher than those provided in this report. Heavy compaction equipment or other construction loads should not be allowed within 4 feet of the retaining walls. Hand operated, or lightweight compaction equipment should be utilized for compacting retaining wall backfill in these areas.

4.2.5 General Fill

Fill placed outside of slab-on-grades, footings and hardscapes should meet the requirements for general fill. General fill used for site grading may be obtained from approved borrow sources. General fill shall classify according to ASTM D2487 as GW, GP, GC, GM, SW, SP, SC, SM, ML (or combinations of these such as SP-SM) materials. In addition, the general fill material shall have a maximum particle size less than 4 inches and shall be free of excess moisture, organic matter and debris.

Materials that are frozen, contaminated, contain excess moisture, organic matter (such as strippings or roots), trash, debris, stones larger than 4 inches, or that classify by ASTM D2487 as

CH, MH, PT, OL, and OH are not suitable for general fill. After the removal of all vegetation and prior to any placement of general fill, the exposed subgrade should be uniformly scarified to a minimum depth of 10 inches, moisture-conditioned as necessary, and compacted to a minimum of 97 percent of the maximum dry density in accordance with ASTM D 698.

After site preparation is completed, general fill should be placed in 8-inch maximum loose horizontal lifts and compacted to at least 97 percent of the maximum dry density as determined by the ASTM D 698 – Standard Proctor compaction test. Each lift should be documented for density and moisture.

4.2.6 Structural Fill

Fill placed below the bottom of slab-on-grade floors, footings, hardscapes should meet the requirements for structural fill. Some soils encountered on the site that tested as loose appeared to meet the requirements for structural fill described below. Structural backfill materials may be onsite or can be obtained from approved borrow sources and should consist of clean, hard, granular material conforming to the following:

Sieve Size	Percent Passing
4-inch	100
No. 4	70-90
No. 200	5-15

Liquid Limit less than 30%.
Plasticity Index less than 12.
Maximum Moist Unit Weight 125 lbs per cubic foot

Materials that are frozen, contaminated, contain excess moisture, organic matter (such as strippings or roots), trash, debris, stones larger than 4 inches are not suitable for structural backfill. If the existing materials contain oversize particles, trash, organics, or other deleterious materials, those materials shall be removed by screening prior to placement as structural fill.

After excavating to native soils, compact any of the native materials disturbed prior to placement of fill. After site preparation is completed, structural fill should be placed in 10-inch maximum loose horizontal lifts and compacted to at least 97 percent of the maximum dry density as determined by the ASTM D698 – Standard Proctor compaction test. Each lift should be documented for density and moisture.

4.2.7 Backfilling Utilities Trenches

Non-organic materials obtained from required project excavations may be used to backfill utilities trenches. Backfill should be placed in uniform horizontal layers not exceeding 10 inches in loose thickness.

In structural areas including roadways and buildings, each layer of the utility trench backfill should be compacted to at least 97 percent of the maximum laboratory dry density as determined by ASTM D698. In non-structural areas, each layer should be compacted to at least 92 percent of the maximum laboratory dry density as determined by ASTM D 698. Jetting or flooding of the backfill material in utility trenches should not be permitted.

4.3 FOUNDATIONS

ABCO should be present prior placement of structural fill or concrete on prepared subgrade to verify the subgrade is prepared according to the recommendations presented in this report. Foundation concrete placement should never be attempted following a significant rain or snow event and the subgrade should never be allowed to freeze prior to concrete placement.

Water standing in foundation excavations must be removed prior to concrete placement. The condition of the subgrade and careful construction procedures are critical to foundation and slab stability and long-term performance of the structure. Based on the results of the subsurface investigation, spread footings may be placed on the native subgrade soils.

We understand that all structural foundations on site will consist of rectangular or square spread footings, or continuous strip footings.

4.3.1 Spread footings (Excavate and Replace)

We recommend that spread footings be proportioned in general accordance with Figure 4 Allowable Bearing Capacity vs Effective Footing Width at 4.5 ft BGS.

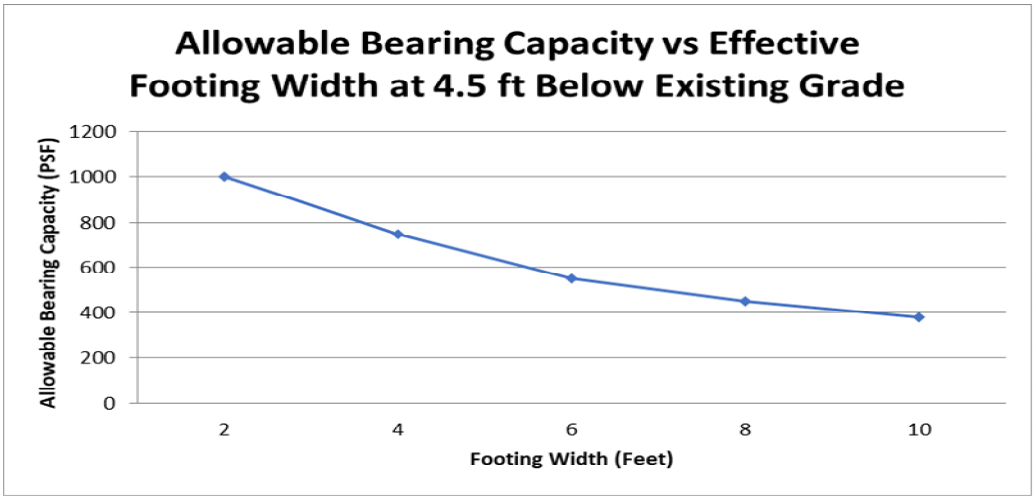


Figure 4 – Allowable Bearing Capacity at Approximately 4.5 feet BGS

If the bearing capacities provided in Figure 4 do not provide sufficient bearing capacity, we recommend the contractor place footings on properly prepared poorly graded gravel (GP) at approximately 7.0 feet BGS. Figure 5 provides allowable bearing capacities vs effective footing widths at 7.0 ft BGS.

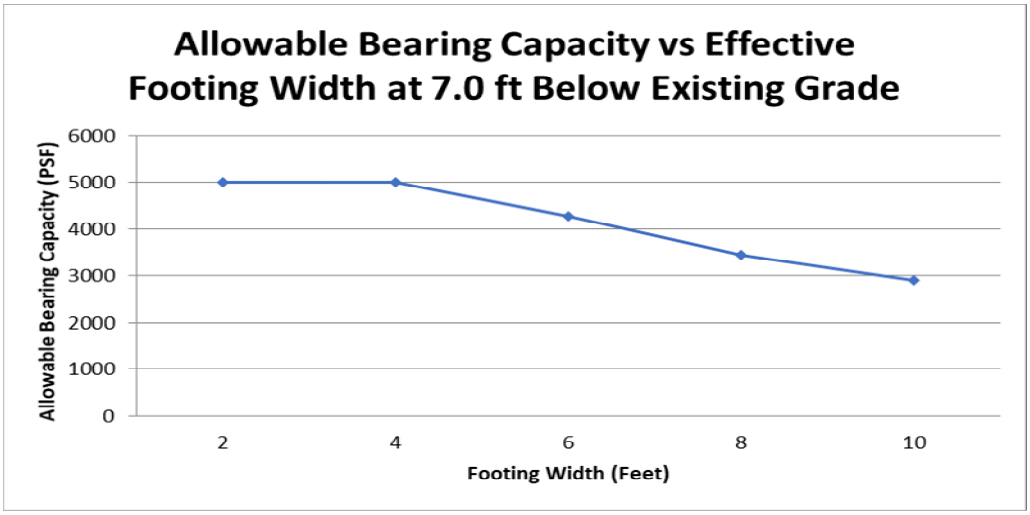


Figure 5 – Allowable Bearing Capacity at Approximately 7.0 feet BGS

The bearing capacity recommendations provided in Figures 4 and 5 are only valid if the recommendations in this report are followed. Spread footing foundations should be prepared according to the following.

- Footings have a maximum width of 10 feet.

- All footings should bear on scarified, moisture conditioned, and compacted native soil as discussed in section 4.2.3 or better, or structural fill compacted as described in Section 4.2.6.
- The bottom of spread footings are placed at least 2 feet below the finished grades for frost protection.
- The native subgrade material of the foundation excavations are observed and probed by ABCO or the responsible geotechnical engineer prior to placement of any structural backfill. If upon inspection, the bottom of excavation appears excessively soft and potentially unstable for subsequent placement of structural backfill, then additional over-excavation may be required as directed by the geotechnical engineer.
- Structural fill placed as described in Section 4.2.6 of this report.
- Any loose or frozen soil or standing water at the base of footing excavations should be removed and replaced with structural fill.
- All structural fill placed beneath footings should extend a minimum of 1-foot horizontally for each 2 feet of thickness placed beneath the footing. The horizontal dimension is measured from the edge of footing.
- Concrete placed on native soil or structural fill can utilize a friction coefficient of 0.4 to resist lateral loads. This coefficient must be reduced by 1/3 if concrete is not cast directly on soil, such as for pre-cast panels.

Spread footings designed in accordance with these criteria would be expected to experience maximum post construction settlement of 1 inch or less, with differential settlements of ½ of 1 inch or less. A one-third increase of the net allowable bearing pressure may be used for transient wind or seismic loads. The recommended allowable bearing capacity charts (Figures 4 and 5) provided should be verified or amended once details of the proposed construction are available. Soil in the area of boring B-3 may be able to support higher loads at a more shallow elevation, possibly resulting in a construction savings. ABCO, or the responsible geotechnical engineer, should be on site during foundation preparation and to evaluate if the foundation subgrade in the area of boring B-3 may be modified.

A greater allowable bearing capacity may be utilized by extending spread footings deeper or utilizing a deep foundation option. Analysis for deep foundations was not included as part of this geotechnical report.

4.4 INTERIOR SLAB-ON-GRADE

Slab-on-grade floors may be used at the site. Prior to constructing slab-on-grade floors, the subgrade must be properly prepared. First, organic topsoil, vegetation, or loose fill material must be stripped from the building area and subgrades must be prepared according to Section 4.2.3 of this report. A modulus of subgrade reaction of 150 pci can be assumed for design purposes for slab floors placed over properly prepared floor slab areas supported on firm native soils or properly compacted structural fill.

If the interior floors will be covered with moisture sensitive floor coverings, a vapor barrier should be used. Minimum sections for slab-on-grade floors with moisture sensitive floor coverings are shown in the table below. If moisture sensitive floor coverings are not used, omit the blotter, vapor retarder and the choker. The sections shown in Table 2 are minimum recommended thicknesses.

Table 3 -Interior Slabs-on-Grade with Moisture Sensitive Floor Covering

Layer	Minimum Thickness (inches)
Concrete with Reinforcement	Computed by Structural Engineer
Blotter	3-1/2
Vapor Retarder	----
Choker	1/2
Granular Base	8
Compacted Subgrade	8

- The purpose of the blotter layer is to absorb excess moisture from the concrete to permit the earliest placement of impermeable floor coatings (urethane, epoxy, or acrylic terrazzo) or floor-covering adhesive. Blotter should be a well-graded 3/8-inch-minus granular material. Blotter should be lightly moist and compacted with two passes of a vibratory plate or vibratory roller. The blotter layer should not be allowed to become saturated prior to placement of the concrete slab.

- Vapor retarder should meet the requirements of a Class A vapor retarder according to ASTM E 1745. The vapor retarder should be sealed to the foundations, at seems and pipe penetrations with sealant tape according to the manufacturer's recommendations.
- Choker should be a clean sand material. The choker layer minimizes puncturing of the vapor retarder by the granular base material.
- Granular base should be placed as a leveling course over the subgrade. The granular base should be compacted to at least 97 percent of the maximum dry density as determined by ASTM D698.
- Compacted subgrade in the building construction area should be prepared as described in Section 4.2.3 of this report.

The concrete should not be placed directly on the vapor retarder. Some buildings are constructed by placing the slab floors directly on the vapor retarder. This has some advantages but also increases several risks due to drying shrinkage, settling and increased slab curl. We recommend reviewing the American Concrete Institute report ACI 302.1R-1 and evaluate the procedures recommended and associated risks prior to changing the design recommendations with respect to use of a blotter layer.

Special precautions should be taken during the placement and curing of all concrete slabs. Excessive slump caused by a high water-cement ratio of the concrete and/or improper curing procedures used during either hot or cold weather could lead to excessive shrinkage, cracking or curling in the slabs. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual and under the observation of International Conference of Building Officials (ICBO) certified technicians.
To reduce the effects of differential movement, it is recommended that floor slabs be separated from all bearing walls and columns with expansion joints. We anticipate concrete slabs will be lightly loaded. The concrete strength, slab thickness, reinforcement, joint design, and joint layout should be addressed in the contract documents.

4.5 SUBSURFACE INFILTRATION OF STORMWATER AND DRAINAGE

ABCO understands that subsurface infiltration of stormwater will take place on site. ABCO performed infiltration tests in boring B-2 and B-3 within the native poorly graded gravel (Stratum III) material encountered at approximately 4.5 to 7 feet BGS. An infiltration rate greater

than 8-inches per hour (in/hr) was measured. We recommend using an infiltration rate of 8 in/hr for design purposes in Stratum III material.

5 CLOSURE

5.1 LIMITATIONS

Recommendations contained in this report are based on our field explorations, laboratory tests, and our understanding of the proposed construction. The study was performed using a mutually agreed upon scope of work. It is our opinion that this study was a cost-effective method to evaluate the subject site and evaluate some of the potential geotechnical concerns. More detailed, focused, and/or thorough investigations can be conducted. Further studies will tend to increase the level of assurance; however, such efforts will result in increased costs. If the Client wishes to reduce the uncertainties beyond the level associated with this study, ABCO Engineering should be contacted for additional consultation.

The soils data used in the preparation of this report were obtained from the field explorations made for this investigation. It is possible that variations in soils exist between the points explored. The nature and extent of soil variations may not be evident until construction occurs. If any soil conditions are encountered at this site that differ from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to our recommendations. In addition, if the scope of the proposed project development changes from the project description given in this report, our firm should be notified.

The recommendations made in this report are based on the assumption that an adequate program of testing, observation, and engineering consultation will be made during construction to verify compliance with the report findings and recommendations. This should include, but not necessarily be limited to, observations and testing described within this report, and engineering consultation as may be required during construction. These observation and testing items are critical with regards to the conclusions and recommendations provided in this report. If these items are not adequately performed during construction, then the Client agrees to assume ABCO Engineering's responsibility for any potential claims that may arise during or after construction. Critical observations and testing include the following:

- stripping of existing vegetation;
- approval of building foundation excavations by our geotechnical engineer;
- proper preparation of improved soil under building foundations;
- approval of excavations for infiltration facilities by our geotechnical engineer.

The report has been prepared for specific application to this project in accordance with the generally accepted standards of practice at the time the report was written. No warranty, express or implied, is made.

This report may be used only by the Client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on- and off-site), or other factors including advances in man's understanding of applied science may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issue. ABCO Engineering should be notified if the project is delayed by more than 24 months from the date of this report so that a review of site conditions can be made, and recommendations revised, if appropriate.

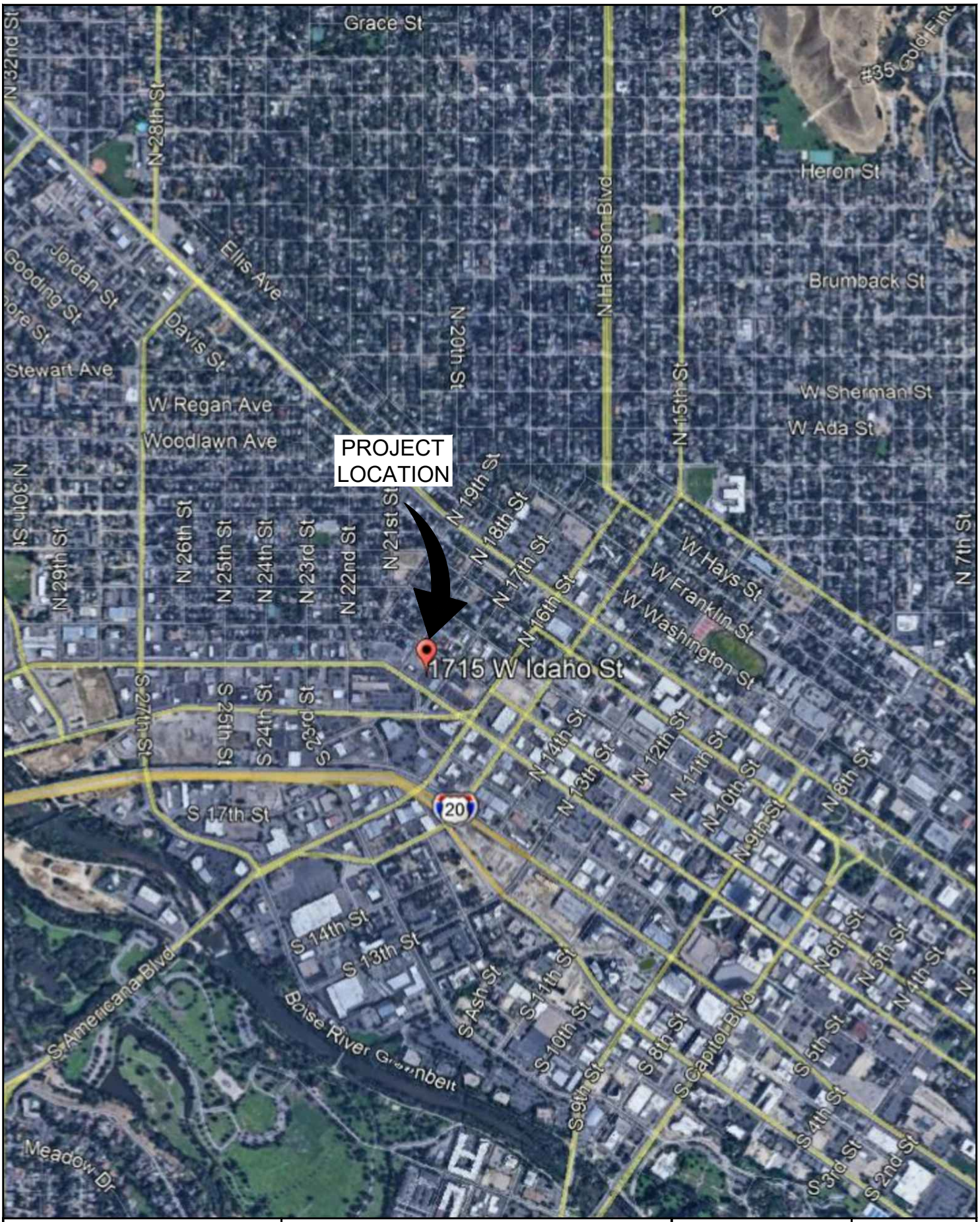
It is the CLIENT'S responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk. Any party other than the Client who wishes to use this report shall notify ABCO Engineering of such intended use by executing the "Application for Authorization to Use" which follows this document as an appendix. Based on the intended use of the report, ABCO Engineering may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release ABCO Engineering from any liability resulting from the use of this report by any unauthorized party.

5.2 REVIEW OF PLANS AND SPECIFICATIONS

ABCO requests the opportunity to review the final plans and specifications for this project to determine if the final design complies with this report prior to submittal to review agencies.

APPENDIX A

FIGURE 1 – VICINITY MAP
FIGURE 2 - EXPLORATION MAP
FIGURE 3 – SOIL IMPROVEMENTS



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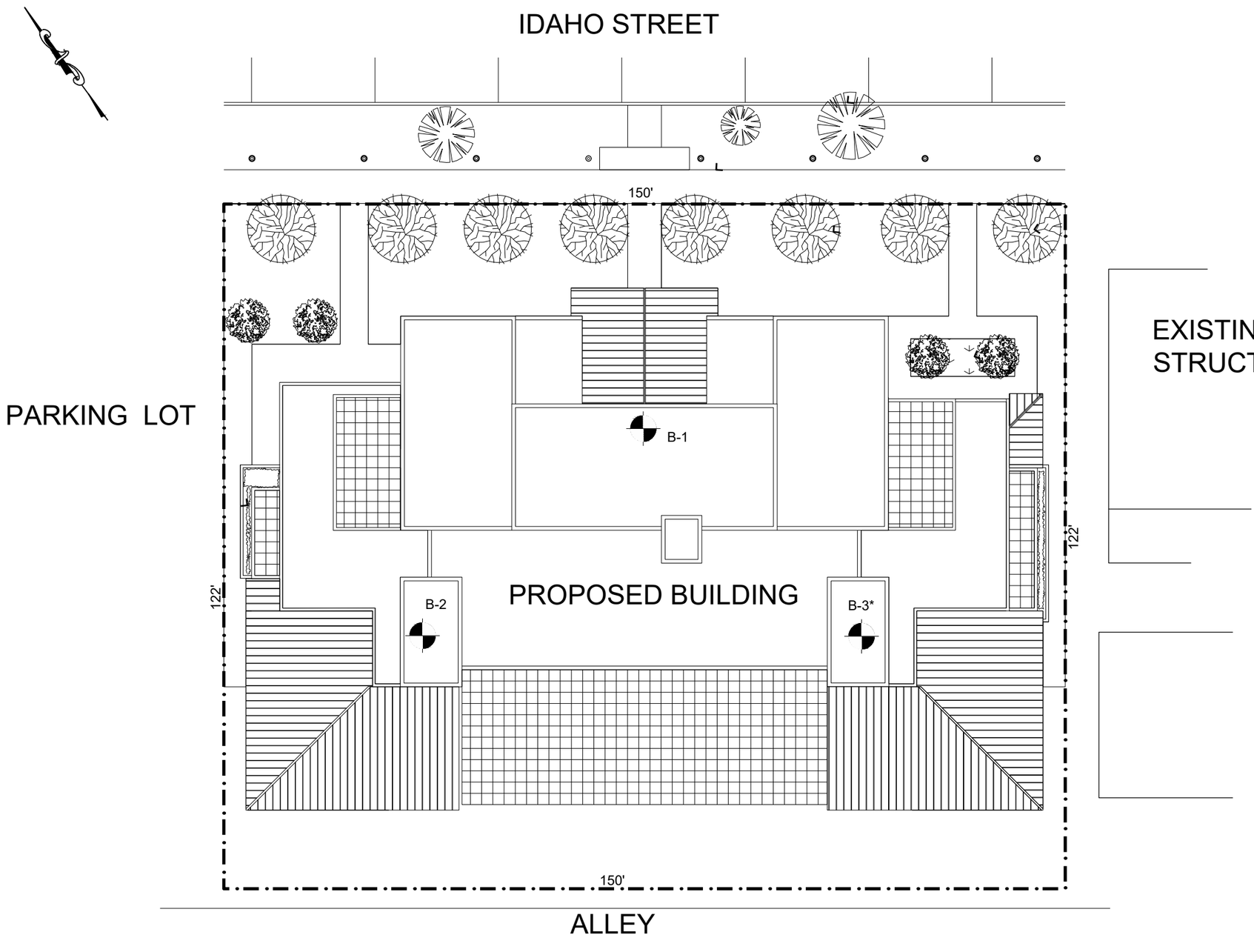
ABCO ENGINEERING

VICINITY MAP
ODYSSEY FLATS TIBBS CONDOS
1715 IDAHO STREET
ADA COUNTY BOISE, ID
MUSSELL CONSTRUCTION, INC.

File Number:	191526
Designed By:	D. BRIGGS
Drawn By:	D. BRIGGS
Date:	DECEMBER 2019

Sheet Number:

FIGURE 1



CALL BEFORE YOU DIG!

1. THE LOCATION OF EXISTING UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE LOCATIONS ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INFORM ALL UTILITY COMPANIES OF THE CONSTRUCTION SCHEDULE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGE WHICH MAY OCCUR BY FAILURE TO EXACTLY LOCATE AND PROTECT ALL UTILITIES.
2. CONTRACTOR SHALL CONTACT DIGLINE 48 HOURS PRIOR TO ANY EARTH DISTURBING ACTIVITIES ON SITE, AND REQUEST LOCATE OF UNDERGROUND UTILITIES.

811 Know what's **below.** **Call** before you dig.

*The 811 logo is a registered trademark of the CGA.

LEGEND

APPROXIMATE SPT SOIL BORING LOCATIONS

B-3* MONITORING WELL INSTALLED

EXPLORATION MAP

1:10 (22x34 FULL SIZE)

Drawing modified from Network Architects Composite Design #1 dated 1.7.19

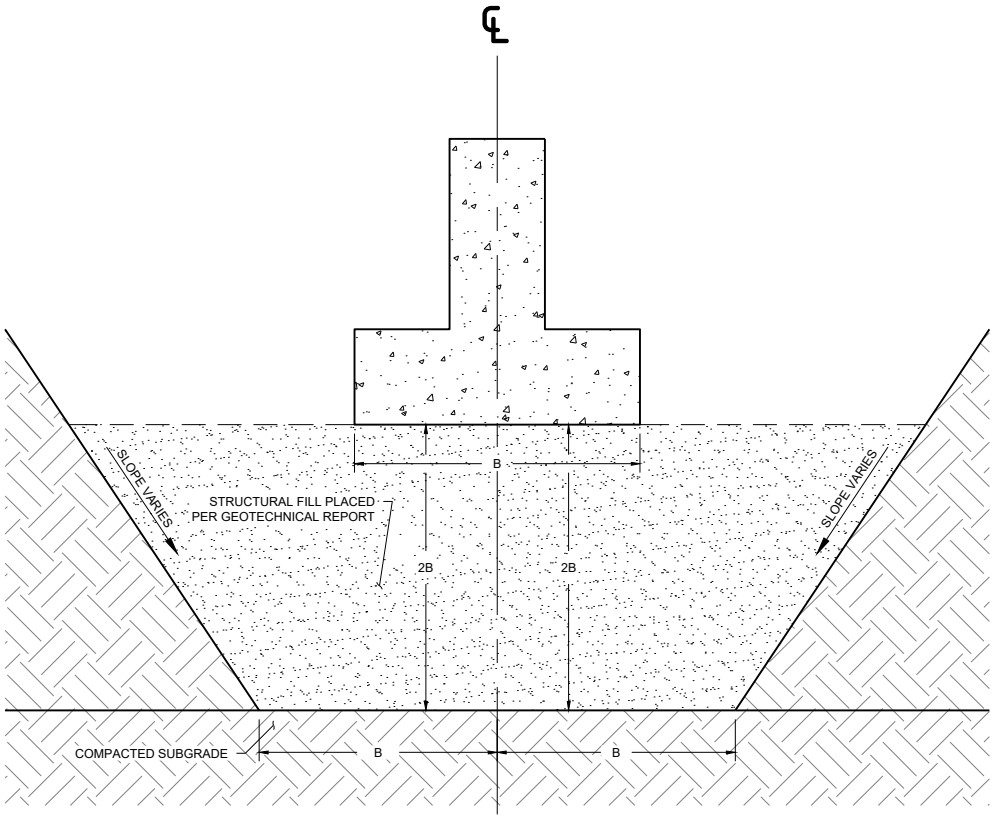
10 5 0 10 30
(SCALE IN FEET)

ABCO ENGINEERING
119 N. Midland Blvd.
Nampa, Idaho 83651
Phone (208) 955-8126

EXPLORATION MAP
ODYSSEY FLATS TIBBS CONDOS
1715 IDAHO STREET BOISE, ID
ADA COUNTY MUSSELL CONSTRUCTION INC.

REVISIONS NO.	DATE	BY	DESCRIPTION

FILE NUMBER: 191526
DESIGNED BY: DAVID BRIGGS
DRAWN BY: D. BRIGGS
DATE: December 2019
SHEET NUMBER: FIGURE 2



SOIL IMPROVEMENT DETAIL

NTS

ABCO ENGINEERING	SOIL IMPROVEMENT DETAIL	File Number:	Sheet Number: FIGURE 3
		Designed By: A. LYMAN Drawn By: T SIGMAN Date: JANUARY 2019	

APPENDIX B

BORING LOGS (B-1, B-2, B-3)
LABORATORY RESULTS
SOILS CLASSIFICATION CHART

ABCO Engineering
119 N Midland Blvd.
Nampa, ID 83687

BORING LOG

ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-1
Water: 9.5 FT
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLIT SPN
Sheet: 1 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
				ASPHALT	2-inches (0.17 feet)
1	SS	4 4 5		FILL: POORLY GRADED SAND (SP) with gravel, About 60% medium coarse grained sand, about 40% gravel, reddish brown, loose, moist	Decomposed granite fragments
2					
3	SS Rec: 8"	4 4 4			
4					
5				NATIVE: POORLY GRADED SAND (SP) with gravel, 88% fine to coarse sand, 7% gravel, 5% fines, light gray, loose, moist.	
6	SS Rec: 11"	4 3 4			
7					
8	SS Rec: 6"	8 6 11		POORLY GRADED GRAVEL (GP) with sand, about 90% gravel, about 10% medium coarse sand, reddish brown, medium dense, moist to saturated.	
9					
10					
11	SS Rec: 6"	8 8 7			
12					
13					
14				POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light gray to light brown, dense to very dense, moist to saturated.	
15	SS Rec: 11"	18 18 17			Sand heave. Water added when augers at 15 feet and each time before pulling center rods.
16					
17					
18					
19					
20	SS Rec: 9"	11-17-19			

ABCO Engineering
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Nampa, ID 83687

BORING LOG

ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-1
Water: 9.5 FEET
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLIT SPN
Sheet: 2 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
21	SS Rec: 9"	11 17 19		POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light gray to light brown, dense to very dense, moist to saturated.	
22					
23					
24					
25	SS Rec: 14"	13 19 25			
26					
27					
28					
29					
30	SS Rec: 10"	44 50/5.5"			
31					
32				Boring Terminated at 31.5 feet	
33					
34					
35					
36					
37					
38					
39					
40					

ABCO Engineering
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Nampa, ID 83687

BORING LOG

ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-2
Water: 8.0 FT
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLT SPN
Sheet: 1 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
1	SS Rec: 12"	6 9 7		FILL: POORLY GRADED SAND (SP) with gravel, About 55% medium coarse grained sand, about 45% gravel, dark brown, medium dense, moist	Roots
2					
3	SS Rec: 5"	5 7 5		FILL: POORLY GRADED GRAVEL (GP-GC) with sand and clay, About 55% gravel, about 38% medium coarse grained sand, about 7% low plasticity clay, black, medium dense, moist	
4					
5	SS Rec: 5"	4 4 5		NATIVE: POORLY GRADED SAND (SP) with gravel, about 85% fine to coarse sand, about 10% gravel, about 5% fines, light gray, loose, moist.	
6					
7					
8	SS Rec: 12"	16 31 41		POORLY GRADED GRAVEL (GP) with sand, about 90% gravel, about 10% medium coarse sand, light brown, dense, moist to saturated.	Infiltration test performed through auger at 7 feet. Infiltration rate > 8 in/hr.
9					
10					
11	SS Rec: 5"	18 20 18			
12					
13					
14				POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light brown to light gray, dense, moist to saturated.	
15					
16	SS Rec: 14"	12 20 20			Sand heave. Water added when augers at 15 feet and each time before pulling center rods.
17					
18					
19					
20	SS Rec: 10"	13-20-26			

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Nampa, ID 83687

BORING LOG

ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-2
Water: 8.0 FEET
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLIT SPN
Sheet: 2 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
21	SS Rec: 10"	13 20 26		POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light brown to light gray, dense, moist to saturated.	
25	SS Rec: 10"	10 17 49			
30	SS Rec: 16"	32 40 32			
32				Boring Terminated at 31.5 feet	

ABCO Engineering
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Nampa, ID 83687

BORING LOG

ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-3
Water: 10.0 FT
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLT SPN
Sheet: 1 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
1	SS Rec: 14"	3 7 7		FILL: POORLY GRADED SAND (SP), About 95% fine to medium coarse grained sand, reddish brown to dark gray, medium dense, moist	Roots, rock fragments, slight organic odor, trace gravel
2					
3	SS Rec: 8"	7 10 15			
4					
5				NATIVE: POORLY GRADED GRAVEL (GP) with sand, about 90% gravel, about 10% medium coarse sand, light brown, dense, moist to saturated.	Granite Fragments
6	SS Rec: 6"	9 17 23			
7					
8	SS Rec: 5"	28 30 13			2-inch diameter temporary PVC pipe installed at 14 ft.
9					Infiltration test performed through PVC pipe. Observed approx. 1 in/sec infiltration.
10					
11	SS Rec: 7"	17 50/5.5"			
12					
13				POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light brown to gray, dense, moist to saturated.	
14					
15					
16	SS Rec: 14"	20 15 16			Sand heave. Water added when augers at 15 feet and each time before pulling center rods.
17					
18					
19					
20	SS Rec: 14"	23-16-14			

ABCO Engineering
119 N Midland Blvd.
Nampa, ID 83687

BORING LOG

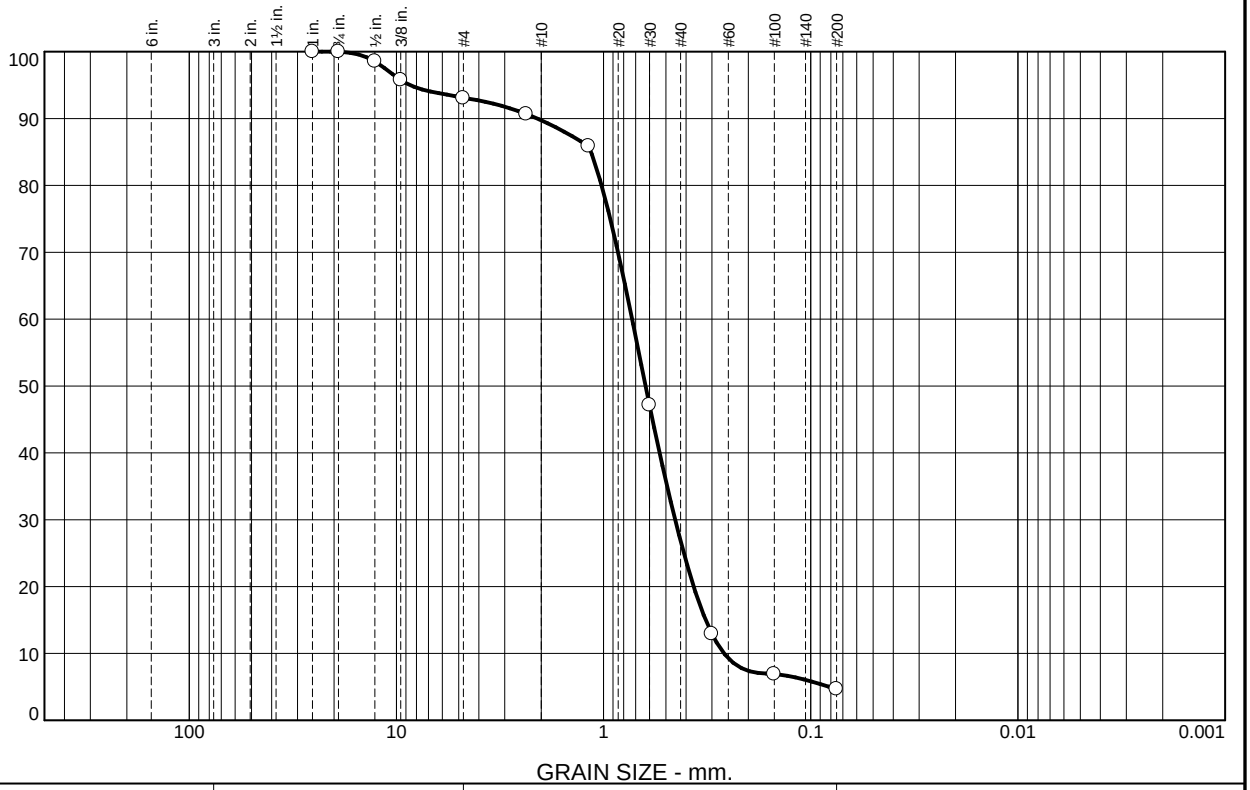
ABCO ENGINEERING

Project: ODYSSEY FLATS
Project No: 191526
Location: 1715 IDAHO STREET
Logged on: 12/5/2019
Logged by: DHB

Boring #: B-3
Water: 10.0 FEET
Driller Info: HAZ-TECH DRILLING; CME-75
Equipment: 4"in.- 8"out. DIA. HOLLOW AUGER; 1.5" SPLIT SPN
Sheet: 2 of 2

DEPTH (ft)	SAMPLE TYPE.	NO. BLOWS	SYMBOL	DESCRIPTION	COMMENTS
21	SS Rec: 14"	23 16 14		POORLY GRADED GRAVEL (GP) with sand, about 70% gravel, about 30% medium coarse sand, light brown to light gray, dense to very dense, moist to saturated.	
22					
23					
24					
25	SS Rec: 13"	9 21 21			
26					
27					
28					
29					
30	SS Rec: 15"	14 32 39			
31					
32				Boring Terminated at 31.5 feet	
33					
34					
35					
36					
37					
38					
39					
40					

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	7	3	63	22	5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4"	100		
1/2"	99		
3/8"	96		
#4	93		
#8	91		
#16	86		
#30	47		
#50	13		
#100	7		
#200	4.7		

* (no specification provided)

Material Description

Poorly Graded Sand

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{90}= 2.0899 D_{85}= 1.1508 D_{60}= 0.7285
D_{50}= 0.6269 D_{30}= 0.4516 D_{15}= 0.3215
D_{10}= 0.2620 C_u= 2.78 C_c= 1.07

Classification

USCS= SP AASHTO= --

Remarks

Sample delivered on 12/13/19 by D. Briggs
Odyssey Flats - ABCO Project No. 191526
1715 Idaho Street

Location: B-1
Sample Number: S519-938 **Depth:** 5-6.5' **Date:** 12/16/19

ALLWEST TESTING & ENGINEERING Meridian, Idaho

Client: ABCO Engineering
Project: ABCO Engineering 2019 Misc. Testing
Project No: 519-047 **Figure**

Tested By: C. Downes **Checked By:** J. Varozza

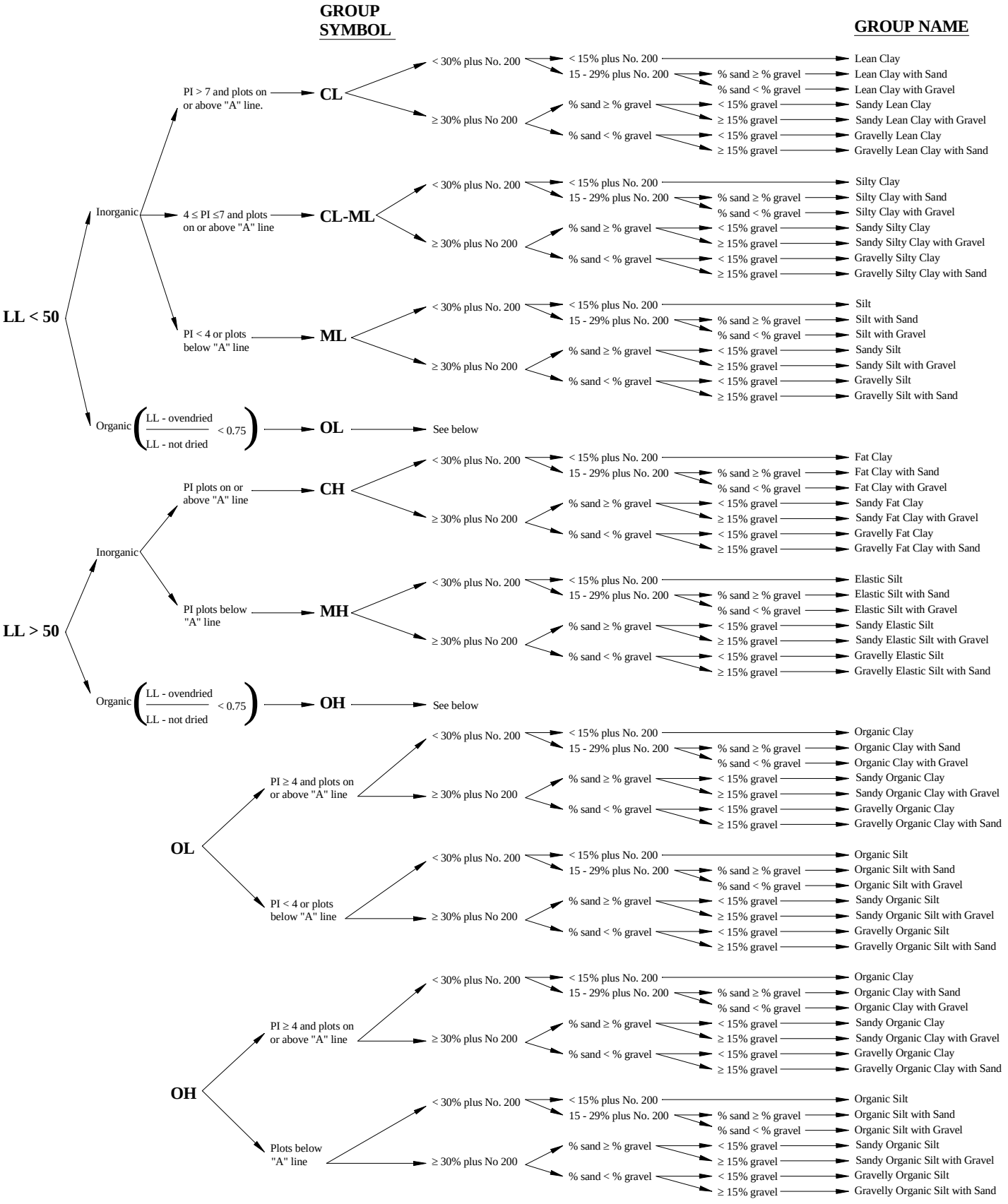
General Legend and Notes for Logs of Exploration

SYMBOL	DESCRIPTION
BG	Small-volume bag sample
BK	Large-volume bulk sample
SS	Standard split-spoon sample (reference ASTM D 1586)
RS	Oversized split-spoon sample with an outside diameter of 3 inches. 6 inch rings inserted in the sampler. Blow counts are not corrected to N-Values unless noted separately on the logs
ST	Thin-walled (Shelby) tube sample with an inside diameter of 2.88 inches unless otherwise noted on the logs (reference ASTM D 1587)
PT	Piston tube sample with an inside tube diameter of 2.88 inches unless otherwise noted on the logs (reference ASTM D 1587)
RS	Ring sample with an inside diameter of 2.42 inches unless otherwise noted on the logs (reference ASTM D 3550)
CR	Core barrel sample (reference ASTM D 2113)
ω	Water content
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
▽	Indicates the measured groundwater level
PP	Pocket Penetrometer (tsf)
MC	Moisture Content

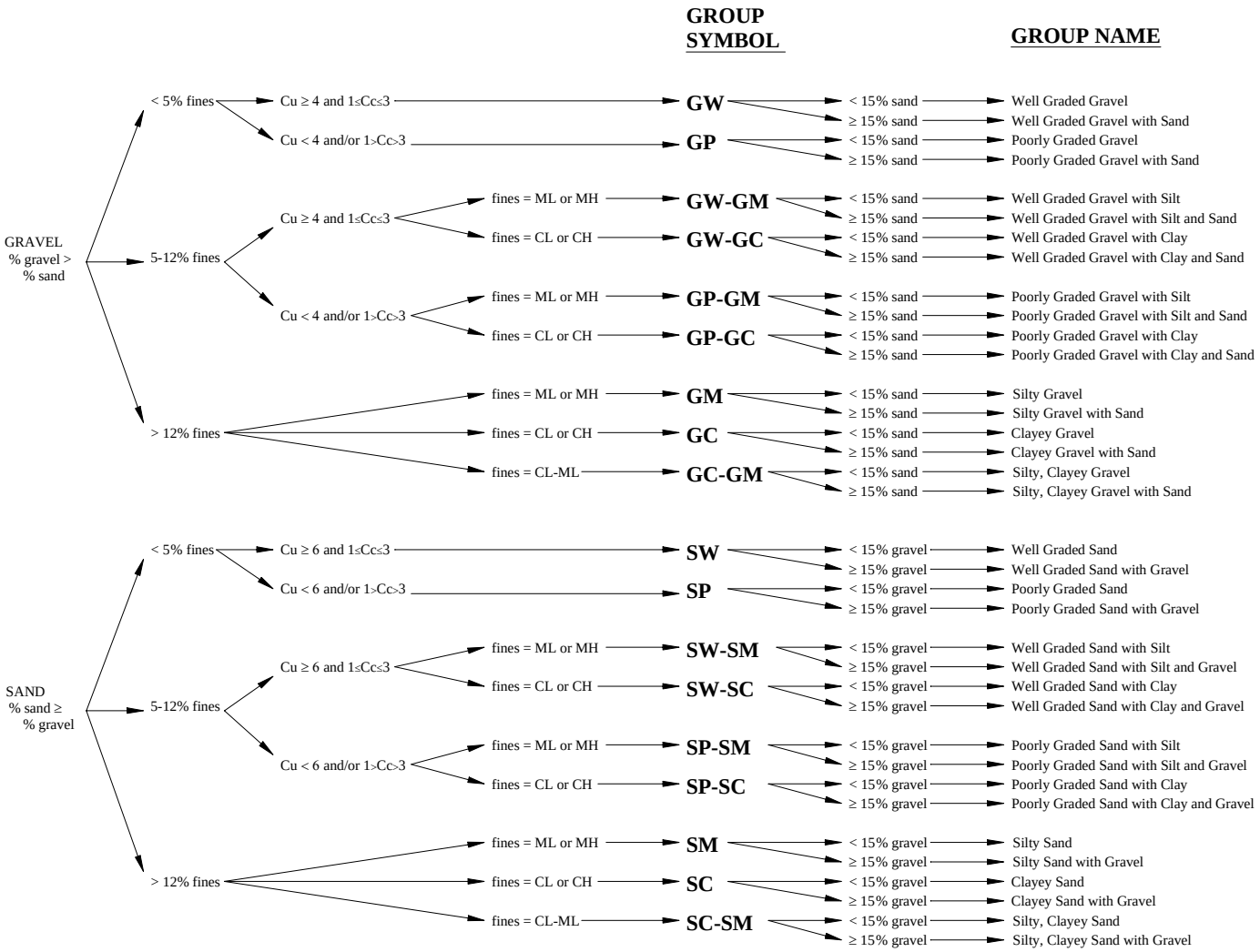
Note:

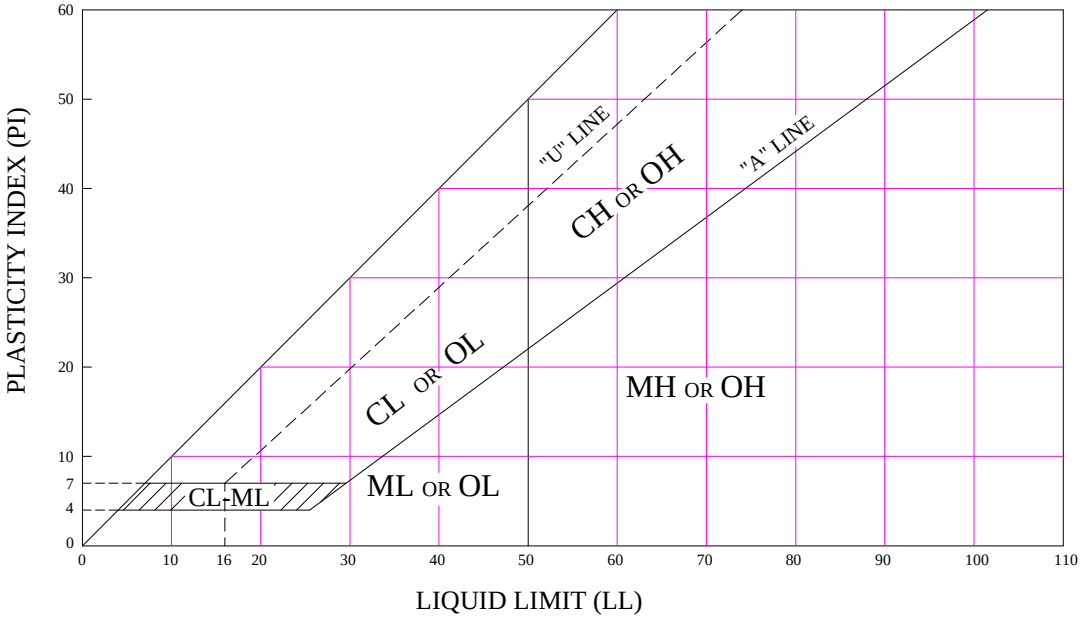
1. Soil samples recovered were identified, described, and classified in the field using ASTM D 2488 (Unified Soil Classification System) as a guide.

ASTM D2487 Soils Classification Chart



ASTM D2487 Soils Classification Chart (cont.)





APPENDIX C

ADDITIONAL REPORTS
NRCS SOILS MAP
SEA SEISMIC MAPS

Soil Map—Ada County, Idaho
(Odyssey Flats Tibbs Condos)

Map Scale: 1:488 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ada County, Idaho
Survey Area Data: Version 7, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 1, 2018—Sep 30, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
9000	Urban land, 0 to 1 percent slopes	0.4	100.0%
Totals for Area of Interest		**0.4**	**100.0%**

Ada County, Idaho

9000—Urban land, 0 to 1 percent slopes

Map Unit Composition

Urban land: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Data Source Information

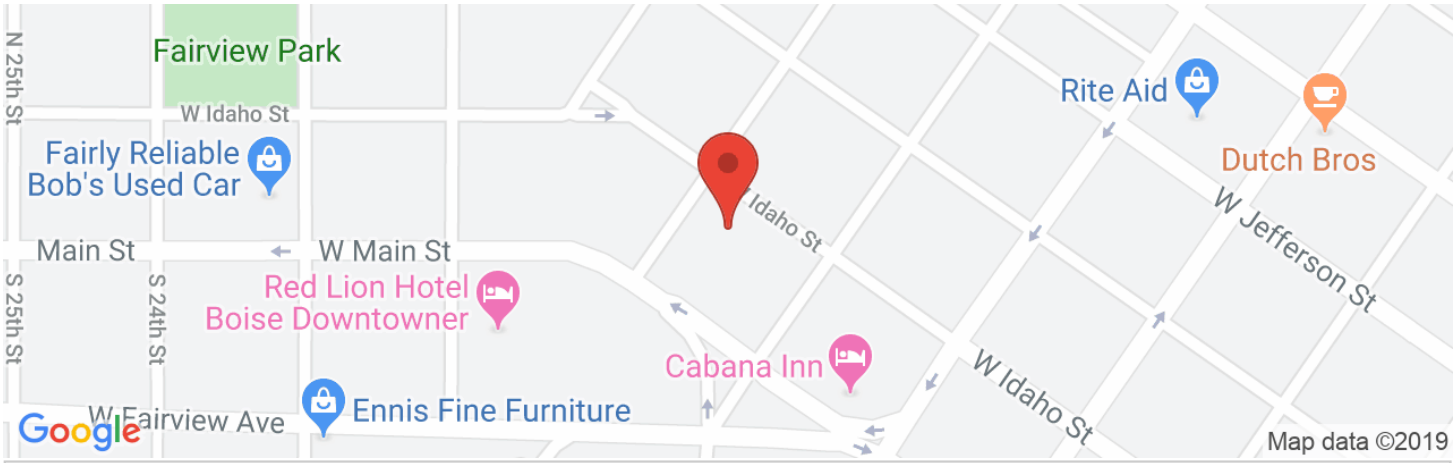
Soil Survey Area: Ada County, Idaho

Survey Area Data: Version 7, Sep 16, 2019

ODYSSEY FLATS

1715 W Idaho St, Boise, ID 83702, USA

Latitude, Longitude: 43.621932, -116.21434499999998



Date	12/31/2019, 3:10:46 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.312	MCE_R ground motion. (for 0.2 second period)
S_1	0.106	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.483	Site-modified spectral acceleration value
S_{M1}	0.252	Site-modified spectral acceleration value
S_{DS}	0.322	Numeric seismic design value at 0.2 second SA
S_{D1}	0.168	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	C	Seismic design category
F_a	1.551	Site amplification factor at 0.2 second
F_v	2.376	Site amplification factor at 1.0 second
PGA	0.122	MCE_G peak ground acceleration
F_{PGA}	1.556	Site amplification factor at PGA
PGA_M	0.19	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.312	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.332	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.106	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.11	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.939	Mapped value of the risk coefficient at short periods
C_{R1}	0.966	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

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APPENDIX D

IMPORTONT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

INFORMATION ABOUT YOUR GEOTECHNICAL REPORT

This engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors such as the general type of the structure involved. The explorations locations and depths are based on the structure size and configuration. Other factors include proposed site features such as overhead utilities, and existing trees. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

This report should not be used without consulting a Geotechnical Engineer if

- Changes are made to the type of construction
- Changes are made to the size, foundation loading or location of proposed structures
- Changes are made to the location the structures or other site features
- If the report is intended to use for any other property

We cannot accept responsibility for problems which may develop if this report is used for any purpose other than the project described here in. Additionally, we cannot be held responsible if we are not consulted after factors considered in this report's development have changed.

This engineering report is prepared to meet the needs of specific individuals. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineers. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

The site exploration described in this report identifies actual subsurface conditions only at the points where samples are taken, when they are taken. Data obtained through excavation, sampling and subsequent laboratory testing are extrapolated by our analysis to derive an opinion about overall subsurface conditions. The information derived is used to estimate the likely reaction of the subsurface soil to the proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal all that is hidden below the surface. Understand that the actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. To help mitigate the unknown a geotechnical engineer should be retained to help interpret conditions encountered during construction, perform appropriate testing, and recommend solutions.

Subsurface conditions may change with time. Natural forces are constantly changing and this geotechnical engineering report is based on conditions that existed at the time of the subsurface exploration. Do not base construction decisions on a geotechnical engineering report whose adequacy may have been affected by time. Additionally, natural events such as floods, earthquakes or changes in groundwater elevations may affect the soils at the site.

Final exploration logs (boring logs) are included in this report and were developed based upon our interpretation of field logs and laboratory evaluation of field samples. The logs should not be separated from the engineering report or redrawn for inclusion in other engineering or construction documents. Always provide access to the complete geotechnical engineering report to contractors or designers. We cannot accept responsibility for problems which may develop if this report is misinterpreted because of unauthorized or incomplete reproduction.