7514 - 7533 15th Avenue NW

Generalized Soil Boring Logs

B-1 Inside Muffler Shop - adjacent to western lift
4' samples driven continuously

S-1	0-4'	0-4" Concrete slab 6" - 4' Dark rusty brown silty and clayey fine to medium sand, trace gravel - no petroleum odor or staining
S-2	4 - 8'	4' - 5' Same 5'- 8' Light brown silty and clayey fine to medium sand, with damp dilatent silt zone and cleaner fine sand zones. no petroleum odor or staining
S-3	8'-9.5' (refusal)	8' - 9.5' Same - grayish brown, increasing density with depth. no petroleum odor or staining no groundwater encountered

B-2 Front Yard of 7518 15th Avenue NW - adjacent to heating oil tank
4' samples driven continuously

S-1	0-4'	0-6" Lawn and topsoil 6" - 4' Rusty brown clayey fine to medium sand, trace gravel, several black organic fragments - no petroleum odor or staining
S-2	4 - 8'	4'- 5.5' Grayish brown clayey fine to medium sand, trace coarse sand no petroleum odor or staining no further recovery
S-3	8'-8.2' (refusal)	8'-8.2' Same no petroleum odor or staining no groundwater encountered

7514 - 7533 15th Avenue NW

Generalized Soil Boring Logs

B-3 Inside Abandoned Structure - near wall in SE portion of building
4' samples driven continuously

S-1	0-4'	0-6" Gravel surface, some localized oil staining 6" - 2' Rusty brown silty fine to medium sand, trace clay 2' - 4' Light brown clayey sand no petroleum odor or staining
S-2	4 - 8'	4'-8' Grayish brown silty fine to medium sand, trace clay, trace gravel no petroleum odor or staining no further recovery
S-3	8 - 12'	8'-12' Same no petroleum odor or staining
S-4	12' - 16'	12-16' Same, increasingly dense with depth no petroleum odor or staining
S-5	16 - 20'	16'- 20' Grayish brown fine to medium sand, little silt, very dense no petroleum odor or staining no groundwater encountered

B-4 Behind Dry Cleaner at 7514 15th Ave. NW - near rear door of building
4' samples driven continuously

S-1	0-4'	0 - 1' Topsoil over base gravel 1'- 3' Rusty brown silty and clayey fine to coarse sand, trace gravel no petroleum odor or staining
S-2	4 - 6' (refusal)	4'- 6' Light grayish brown clayey fine to coarse sand, trace silt and coarser sand no petroleum odor or staining no groundwater encountered

B-5 Inside Abandoned Structure - near W center of building
4' samples driven continuously

S-1	0 - 4'	0-6" Gravel surface 6" - 2' Rusty brown silty fine to medium sand, trace clay 2' - 4' Light brown clayey sand no petroleum odor or staining
S-2	4 - 8'	4'-8' Grayish brown silty fine to medium sand, trace clay, trace gravel no petroleum odor or staining no groundwater encountered

7514 - 7533 15th Avenue NW

Generalized Soil Boring Logs

B-6 In paved area of Muffler Shop drive area at 7530 Avenue NW - near storm drain
4' samples driven continuously

S-1	0 - 4'	0 - 1' Asphalt paving over base gravel 1'- 3' Mottled rusty brown silty and clayey fine to coarse sand, trace gravel no petroleum odor or staining
S-2	4' - 8'	4'- 6' Grayish brown silty fine to medium sand no petroleum odor or staining no further recovery
S-3	8' -12'	8'-12' Grayish brown silty fine to medium sand, no petroleum odor or staining
S-4	12' - 15' (refusal)	12' - 15' Same, denser no petroleum odor or staining no groundwater encountered

B-7 Behind Dry Cleaner at 7514 15th Ave. NW - near S. Edge of parking lot
4' samples driven continuously

S-1	0 - 4'	0 - 1' Topsoil over base gravel 1'- 3' Mottled rusty brown silty and clayey fine to coarse sand, trace gravel no petroleum odor or staining
S-2	4' - 8'	4'- 6' Same no petroleum odor or staining
S-3	8' -12'	8'-12' Grayish brown fine to medium sand, denser no petroleum odor or staining
S-4	12' - 15' (refusal)	12' - 15' Same, very dense no petroleum odor or staining no groundwater encountered

Westernco Donut Shop
7500 15th Avenue NW

Generalized Soil Logs

B-1 at location of old grease shed on N. Side of parking lot
5' samples driven continuously

S-1	0-5'	0-6" Asphalt and base gravel 6" - 2' Silty fine to medium sand, trace clay -mottled yellowish brown tint no petroleum odor or staining no further recovery
S-2	5 - 10'	5'- 9' Light gray silty fine to medium sand, trace clay and coarser sand no petroleum odor or staining
S-3	10-14' (refusal)	10'-10.5' Same - rock in shoe - no further recovery no groundwater encountered

B-2 in front of door of current building
5' samples driven continuously

S-1	0-5'	0-6" Asphalt and base gravel 6" - 3' Silty fine to medium sand -mottled yellowish brown tint no petroleum odor or staining no further recovery
S-2	5 - 10'	5'- 6' Light grayish brown fine to medium sand, trace silt, trace coarse sand no petroleum odor or staining no further recovery
S-3	10-15'	10' - 14' Same
S-4	15 - 18' (refusal)	15' - 18' Light grayish brown fine to medium sand no petroleum odor or staining no groundwater encountered

Westernco Donut Shop
7500 15th Avenue NW

Generalized Soil Logs

B-3 SW corner of parking lot, N of building, near catch basin
5' samples driven continuously

S-1	0-5'	0-6" Asphalt and base gravel 6" - 3' Silty fine to medium sand, trace clay - mottled brown tint no petroleum odor or staining no further recovery
S-2	5 - 10'	5'-8' Grayish brown silty fine to medium sand, trace clay, trace gravel no petroleum odor or staining no further recovery
S-3	10 - 15'	10'-14' Same no petroleum odor or staining no further recovery
S-4	15 - 18' (refusal)	15-18' Grayish brown fine to medium sand, trace silt and clay in lenses no petroleum odor or staining
S-5	18 - 23' (refusal)	18- 23' Same no petroleum odor or staining no groundwater encountered

B-4 NW corner of parking lot
5' samples driven continuously

S-1	0-5'	0-6" Asphalt and base gravel 6" - 3' Rusty yellowish brown silty fine to medium sand, trace clay no petroleum odor or staining no further recovery
S-2	5 - 10'	5'- 9' Light grayish brown fine to medium sand, trace silt and coarser sand no petroleum odor or staining
S-3	10 -15'	10'-14' Same, increase in clay no petroleum odor or staining
S-4	15 - 19' (Refusal)	15'-19' Light brown fine sand, trace silt no petroleum odor or staining no groundwater encountered

Westernco Donut Shop
7500 15th Avenue NW

Generalized Soil Logs

B-5 East of grocery building at 7510 15th Ave. NW
5' samples driven continuously

S-1	0 - 5'	0 - 2' Gravel fill with minor layers of debris and coal 2' - 4' Brown silty fine to medium sand no petroleum odor or staining no further recovery
S-2	5 - 10'	5'- 9' Light grayish brown silty fine to medium sand, trace clay, trace gravel no petroleum odor or staining
S-3	10 -15'	10'-14' Light brown fine sand, trace silt no petroleum odor or staining no groundwater encountered

B-6 South of donut shop building, adjacent to sidewalk
5' samples driven continuously

S-1	0 - 5'	0 - 6" Concrete and gravel fill 6" - 2' Brown silty fine to medium sand, trace clay no petroleum odor or staining no further recovery
S-2	5 - 10'	5'- 9' Light grayish brown fine to medium sand, trace silt, trace clay no petroleum odor or staining
S-3	10 -14' (Refusal)	10'-14' Light brown fine sand, trace silt no petroleum odor or staining no groundwater encountered

GEOTECH
CONSULTANTS, INC.

13256 Northeast 20th Street, Suite 16
Bellevue, Washington 98005
(425) 747-5618 FAX (425) 747-8561

March 26, 2015

JN 14187-1

U District Investments, LLC
1518 – 1st Avenue South, Suite 301
Seattle, Washington 98134

Attention: Michael Pollard *via email: michael.pollard@isolacm.com*

Subject: **Supplemental Geotechnical Engineering Study**
Proposed Residential Development
7500 & 7510 – 15th Avenue Northwest
Seattle, Washington

Dear Mr. Pollard:

We have prepared this letter to provide geotechnical recommendations concerning the proposed residential development to be constructed at 7550 and 7510 – 15th Avenue Northwest in Seattle. We prepared a geotechnical engineering study dated June 17, 2014 for the three parcels immediately to the north: 7514, 7518, and 7530 – 15th Avenue Northwest. We understand that the project site now includes the 7500 and 7510 properties. We also understand that the project will not require substantial excavations; the lowest level of the development will be close to the existing ground surface. This letter should be considered supplemental to our previous report.

We explored subsurface conditions by drilling one test boring at the approximate location shown on the Site Exploration Plan, Plate 1. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The boring was drilled on January 28, 2015 using a track-mounted, hollow-stem auger drill. Samples were taken at approximate 2.5- and 5-foot intervals with a standard penetration sampler. This split-spoon sampler, which has a 2-inch outside diameter, is driven into the soil with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler a given distance is an indication of the soil density or consistency. A geotechnical engineer from our staff observed the drilling process, logged the test borings, and obtained representative samples of the soil encountered. The Test Boring Logs are attached as Plate 2.

The test boring encountered silty sand with gravel that was loose at a depth of 2.5 feet, became medium-dense at a depth of 5 feet, and then very dense at a depth of 10 feet. Very dense sand with silt and gravel was encountered at a depth of 15 feet, and continued to the maximum depth of the boring. No groundwater seepage was observed in the test boring.

The subsurface conditions encountered in our supplemental test boring are very similar to those encountered in our previous test borings to the north. In our opinion the recommendations in our previous report are appropriate for the complete, enlarged project site.

The following plates are attached to complete this report:

Plate 1	Site Exploration Plan
Plate 2	Test Boring Logs

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

JAMES HOUSTON STRANGE JR.
STATE OF WASHINGTON
36094
REGISTERED
PROFESSIONAL ENGINEER

3/26/15

James H. Strange, Jr., P.E.
Associate

cc: **Malsam Tsang** – Marc Malsam
via email: marc@malsam-tsang.com

TRC/JHS: at

NORTH

Legend:

Test Boring Location

GEOTECH
CONSULTANTS, INC.

SITE EXPLORATION PLAN

7500 & 7510 - 15th Avenue Northwest
Seattle, Washington

Job No:	Date:		Plate:
14187-1	March 2015	No Scale	1

BORING 6

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
						2 inches asphalt pavement over;
					SM	Rust-brown mottled gray-brown silty SAND with gravel, fine to coarse-grained, moist, loose
			6	1		
5			23	2		-becomes medium-dense
10			51	3		-becomes very dense
					SW SM	Gray-brown SAND with silt and gravel, fine to coarse-grained, moist, very dense
15			75	4		
20						
25						

*** Test boring was terminated on January 28, 2015 at 16.5 feet.**
*** No groundwater seepage was observed during drilling.**

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CONSULTANTS, INC.

TEST BORING LOG

7500 & 7510 - 15th Avenue Northwest
Seattle, Washington

Job	*Date:*	*Logged by:*	*Plate:*
14187-1	March 2015	TRC	2

GEOTECH
CONSULTANTS, INC.

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June 17, 2014

JN 14187

U District Investments, LLC
1518 – 1st Avenue South, Suite 301
Seattle, Washington 98134

Attention: Michael Pollard *via email: michael.pollard@isolacm.com*

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Townhome Development
7514, 7518, and 7530 – 15th Avenue Northwest
Seattle, Washington

Dear Mr. Pollard:

We are pleased to present this geotechnical engineering report for the townhome development to be constructed in Seattle, Washington. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design criteria for foundations, retaining walls, and temporary shoring. This work was authorized by your acceptance of our proposal dated May 21, 2014.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

James H. Strange, P.E.
Associate

TRC/JHS:at

GEOTECHNICAL ENGINEERING STUDY
Proposed Townhome Development
7514, 7518, and 7530 – 15th Avenue Northwest
Seattle, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed townhome development to be located in Ballard.

We were provided with a site plan by Julian Weber Architecture + Design dated February 25, 2014. Based on this plan and on conversations with our client, we understand that the development will consist of 33 townhomes with an underground parking garage. The plan shows that the building will generally be set back 3 to 5 feet from property lines, but the northern 80 feet of the development will have a setback of 15 feet from the eastern property line. The garage is expected to cover most of the project site, and we anticipate that it will require an excavation on the order of 10 feet.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the site, which is composed of four parcels of land. The site is bordered to the west by 15th Avenue Northwest, to the north and east by residences, and to the south by a grocery store connected to an apartment. King County iMAP shows an apparent undeveloped alley right-of-way between the southern 125 feet of the site and the residential parcels to the east. We do not know if any of that right-of-way is part of the subject site.

We have not been provided with a survey of the site, but it appears that the brick mixed-use building to the south is very close to the southern property line. The brick wall adjacent to the site exhibits a few narrow cracks in the mortar lines, and does not appear to be in solid condition. King County records show that the adjacent southern mixed-use building does not have a basement. Additionally, the residence north of the site is about 3 feet north of the northern property line. King County records show that the adjacent northern residence has a full basement.

The site slopes gently down toward the south, with a change in elevation of about 7 feet across a distance of 200 feet. There are no steep slopes within or near the site. The site is developed with several buildings; one used as an auto-repair shop, one used as a retail store and an apartment, and one used as a drycleaner. The concrete shell of a rectangular building is located in the north-central portion of the site; this shell is about 20 feet high. It appears that the construction of this building ceased shortly after it began. Two detached garages are located in the southeast portion of the site. Asphalt pavement is located in the northwest corner of the site, and two concrete slabs are located along the northern edge of the site. Portions of the site are vegetated with grass lawns, landscaping bushes, and a few evergreen and deciduous trees. The remainder of the site is covered with gravel and used for vehicle parking.

SUBSURFACE

The subsurface conditions were explored by drilling five test borings at the approximate locations shown on the Site Exploration Plan, Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The borings were drilled on June 5, 2014 using a track-mounted, hollow-stem auger drill. Samples were taken at approximate 5-foot intervals with a standard penetration sampler. This split-spoon sampler, which has a 2-inch outside diameter, is driven into the soil with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler a given distance is an indication of the soil density or consistency. A geotechnical engineer from our staff observed the drilling process, logged the test borings, and obtained representative samples of the soil encountered. The Test Boring Logs are attached as Plates 3 through 7.

Soil Conditions

Below a layer of topsoil about 12 to 18 inches thick, the test borings encountered medium-dense to dense silty sand with gravel and sand with silt and gravel that extended to depths of about 10.5 to 13 feet. The silty sand with gravel was generally above the sand with silt and gravel, but in Test Boring 4 the reverse was true. The borings encountered dense to very dense sand from depths of about 10.5 to 13 feet down to the maximum depths of the borings, 21.5 feet below the ground surface.

No obstructions were revealed by our explorations. However, debris, buried utilities, and old foundation and slab elements are commonly encountered on sites that have had previous development.

Groundwater Conditions

No groundwater seepage was observed in the test borings, which were left open for only a short time period. Therefore, the absence of seepage levels on the logs may not accurately indicate the lack of a static/perched groundwater level. Groundwater levels encountered during drilling can be deceptive, because seepage into the boring can be blocked or slowed by the auger itself. It should be noted that groundwater levels vary seasonally with rainfall and other factors. We anticipate that groundwater could be found in more permeable soil layers and between the near-surface weathered soil and the underlying denser soil.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. If a transition in soil type occurred between samples in the borings, the depth of the transition was interpreted. The relative densities and moisture descriptions indicated on the test boring logs are interpretive descriptions based on the conditions observed during drilling.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

The test borings conducted for this study encountered soils that were medium-dense to dense at a depth of 5 feet, and very dense at depths of 10 feet. We anticipate that the proposed parking garage excavation will expose competent native soils that will provide adequate support to the proposed development.

Temporary excavations in the medium-dense to very dense soils encountered in the upper 10 feet in our test borings can have an inclination as steep as 1:1 (H:V). Where temporary excavations cannot be contained within the subject site, agreements with neighboring property owners allowing temporary excavations extending into adjacent properties will be required. If such agreements cannot be obtained, shoring will be necessary. It seems likely that shoring will be required along the northern, western, and southern sides of the development, and possibly along some of the eastern side. Where excavations will extend within a 1:1 (H:V) line extending beyond the foundation of the mixed-use building south of the site, shoring should be strengthened to reduce the potential for movement of that foundation. Additional shoring recommendations are provided in the ***Temporary Shoring*** section of this report.

The erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered. We anticipate that a silt fence will be needed around the downslope sides of any cleared areas. Existing pavements, ground cover, and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Rocked staging areas and construction access roads should be provided to reduce the amount of soil or mud carried off the property by trucks and equipment. Wherever possible, the access roads should follow the alignment of planned pavements. Trucks should not be allowed to drive off of the rock-covered areas. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Following clearing or rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

As with any project that involves demolition of existing site buildings and/or extensive excavation and shoring, there is a potential risk of movement on surrounding properties. This can potentially translate into noticeable damage of surrounding on-grade elements, such as foundations and slabs. However, the demolition, shoring, and/or excavation work could just translate into *perceived* damage on adjacent properties. Unfortunately, it is becoming more and more common for adjacent property owners to make unsubstantiated damage claims on new projects that occur close to their developed lots. Therefore, we recommend making an extensive photographic and visual survey of the project vicinity, prior to demolition activities, installing shoring, and/or commencing with the excavation. This documents the condition of buildings, pavements, and utilities in the immediate vicinity of the site in order to avoid, and protect the owner from, unsubstantiated damage claims by surrounding property owners. Additionally, any adjacent structures should be monitored during construction to detect soil movements. To monitor their performance, we recommend establishing a series of survey reference points to measure any horizontal deflections of the shoring system. Control points should be established at a distance well away from the walls and slopes, and deflections from the reference points should be measured throughout construction by survey methods.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the Seattle Building Code (SBC), the site soil profile within 100 feet of the ground surface is best represented by Site Class Type C (Very Dense Soil and Soft Rock). As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.28g and 0.44g, respectively.

The SBC states that a site-specific seismic study need not be performed provided that the peak ground acceleration be equal to $S_{DS}/2.5$, where S_{DS} is determined in ASCE 7. It is noted that S_{DS} is equal to $2/3S_{MS}$. S_{MS} equals F_a times S_S, where F_a is determined in Table 11.4-1. For our site, F_a = 1.0. The calculated peak ground acceleration that we utilized for the seismic-related parameters of this report equals 0.34g.

The site soils are not susceptible to seismic liquefaction because of their dense nature. This statement regarding liquefaction includes the knowledge of the determined peak ground acceleration noted above.

CONVENTIONAL FOUNDATIONS

The proposed structure can be supported on conventional continuous and spread footings bearing on undisturbed, medium-dense, native soil, or on structural fill placed above this competent native soil. See the section entitled ***General Earthwork and Structural Fill*** for recommendations regarding the placement and compaction of structural fill beneath structures.

We recommend that continuous and individual spread footings have minimum widths of 12 and 16 inches, respectively. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required. Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand.

For footings founded at least 8 feet below existing grade and on dense, native soils an allowable bearing pressure of 6,000 pounds per square foot (psf) is appropriate. For shallower footings founded on medium-dense to dense native soils an allowable bearing pressure of 3,000 psf is appropriate. A one-third increase in these design bearing pressures may be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil will be about one-inch, with differential settlements on the order of one-half-inch in a distance of 30 feet along a continuous footing with a uniform load.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill. We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.45
Passive Earth Pressure	375 pcf

Where: pcf is pounds per cubic foot, and Passive Earth Pressure is computed using the equivalent fluid density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend maintaining a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate values.

FOUNDATION AND RETAINING WALLS

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Active Earth Pressure *	35 pcf
Passive Earth Pressure	375 pcf
Coefficient of Friction	0.45
Soil Unit Weight	130 pcf

Where: pcf is pounds per cubic foot, and Active and Passive Earth Pressures are computed using the equivalent fluid pressures.
*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above active equivalent fluid pressure.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added to the above lateral soil pressures. Where sloping backfill is desired behind the walls, we will need to be given the wall dimensions and the slope of the backfill in order to provide the appropriate design earth pressures. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density. Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired. The passive pressure given is appropriate only for a shear key poured directly against undisturbed native soil, or for the depth of level, well-compacted fill placed in front of a retaining or foundation wall. The values for friction and passive resistance are ultimate values and do not include a safety factor. We recommend a safety factor of at least 1.5 for overturning and sliding, when using the above values to design the walls. Restrained wall soil parameters should be utilized for a distance of 1.5 times the wall height from corners or bends in the walls. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

The surcharge wall loads that could be imposed by the design earthquake can be modeled by adding a uniform lateral pressure to the above-recommended active pressure. The recommended surcharge pressure is 7**H** pounds per square foot (psf), where **H** is the design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. If the native sand is used as backfill, a minimum 12-inch width of free-draining gravel or a drainage composite similar to Miradrain 6000 should be placed against the backfilled retaining walls. The drainage composites should be hydraulically connected to the foundation drain system. For increased protection, drainage composites should be placed along cut slope faces, and the walls should be backfilled entirely with free-draining soil. The later section entitled ***Drainage Considerations*** should also be reviewed for recommendations related to subsurface drainage behind foundation and retaining walls.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. Water percolating through pervious surfaces (pavers, gravel, permeable pavement, ect.) must also be prevented from flowing toward walls or into the backfill zone. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is important to prevent a build up of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

SLABS-ON-GRADE

The building floors can be constructed as slabs-on-grade atop competent native soil, or on structural fill. The subgrade soil must be in a firm, non-yielding condition at the time of slab construction or underslab fill placement. Any soft areas encountered should be excavated and replaced with select, imported structural fill.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or products. ACI also notes that vapor *retarders* such as 6-mil plastic sheeting have been used in the past, but are now recommending a minimum 10-mil thickness for better durability and long term performance. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection. If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

In the recent past, ACI (Section 4.1.5) recommended that a minimum of 4 inches of well-graded compactable granular material, such as a 5/8-inch-minus crushed rock pavement base, be placed over the vapor retarder or barrier for their protection, and as a "blotter" to aid in the curing of the concrete slab. Sand was not recommended by ACI for this purpose. However, the use of material over the vapor retarder is controversial as noted in current ACI literature because of the potential that the protection/blotter material can become wet between the time of its placement and the installation of the slab. If the material is wet prior to slab placement, which is always possible in the Puget Sound area, it could cause vapor transmission to occur up through the slab in the future, essentially destroying the purpose of the vapor barrier/retarder. Therefore, if there is a potential that the protection/blotter material will become wet before the slab is installed, ACI now recommends that no protection/blotter material be used. However, ACI then recommends that, because there is a potential for slab curl due to the loss of the blotter material, joint spacing in the slab be reduced, a low shrinkage concrete mixture be used, and "other measures" (steel reinforcing, etc.) be used. ASTM E-1643-98 "Standard Practice for Installation of Water Vapor

Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs" generally agrees with the recent ACI literature.

We recommend that the contractor, the project materials engineer, and the owner discuss these issues and review recent ACI literature and ASTM E-1643 for installation guidelines and guidance on the use of the protection/blotter material.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the soil at the subject site would generally be classified as Type B. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand or loose soil can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

All permanent cuts into native soil should be inclined no steeper than 2:1 (H:V). Compacted fill slopes should not be constructed with an inclination greater than 2:1 (H:V). To reduce the potential for shallow sloughing, fill must be compacted to the face of these slopes. This can be accomplished by overbuilding the compacted fill and then trimming it back to its final inclination. Adequate compaction of the slope face is important for long-term stability and is necessary to prevent excessive settlement of patios, slabs, foundations, or other improvements that may be placed near the edge of the slope.

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

TEMPORARY SHORING

The sensitivity of adjacent buildings and utilities must be considered in the design to reduce the risk of causing settlement of these adjacent elements. Regardless of the system used, all shoring systems will deflect in toward the excavation. Therefore, there is always a risk of noticeable settlement occurring on the ground behind the shoring wall.

The shoring design should be submitted to Geotech Consultants, Inc. for review prior to beginning site excavation. We are available and would be pleased to assist in this design effort.

Soldier Pile Installation

Soldier pile walls would be constructed after making planned cut slopes, and prior to commencing the mass excavation, by setting steel H-beams in a drilled hole and grouting the space between the beam and the soil with concrete for the entire height of the drilled hole. We anticipate that the holes could be drilled without casing, but the contractor should be prepared to case the holes or use the slurry method if caving soil is encountered. Excessive ground loss in the drilled holes must be avoided to reduce the potential for settlement on adjacent properties. If water is present in a hole at the time the soldier pile is poured, concrete must be tremied to the bottom of the hole.

As excavation proceeds downward, the space between the piles should be lagged with timber, and any voids behind the timbers should be filled with pea gravel, or a slurry comprised of sand and fly ash. Treated lagging is usually required for permanent walls, while untreated lagging can often be utilized for temporary shoring walls. Temporary vertical cuts will be necessary between the soldier piles for the lagging placement. The prompt and careful installation of lagging is important, particularly in loose or caving soil, to maintain the integrity of the excavation and provide safer working conditions. Additionally, care must be taken by the excavator to remove no more soil between the soldier piles than is necessary to install the lagging. Caving or overexcavation during lagging placement could result in loss of ground on neighboring properties. Timber lagging should be designed for an applied lateral pressure of 30 percent of the design wall pressure, if the pile spacing is less than three pile diameters. For larger pile spacings, the lagging should be designed for 50 percent of the design load.

If permanent building walls are to be constructed against the shoring walls, drainage should be provided by attaching a geotextile drainage composite with a solid plastic backing, similar to Miradrain 6000, to the entire face of the lagging, prior to placing waterproofing and pouring the foundation wall. These drainage composites should be hydraulically connected to the foundation drainage system through weep holes placed in the foundation walls.

Soldier Pile Wall Design

Temporary soldier pile shoring that is cantilevered and that has a level backslope, should be designed for an active soil pressure equal to that pressure exerted by an equivalent fluid with a unit weight of 30 pounds per cubic foot (pcf). Traffic surcharges can typically be accounted for by increasing the effective height of the shoring wall by 2 feet. Existing adjacent buildings will exert surcharges on the proposed shoring wall, unless the buildings are underpinned. Slopes above the shoring walls will exert additional surcharge pressures. These surcharge pressures will vary, depending on the configuration of the cut slope and shoring wall. We can provide recommendations regarding slope and building surcharge pressures when the preliminary shoring design is completed.

Where shoring will be installed to support excavations that extend within a 1:1 (H:V) line extending beyond the foundation of the mixed-use building south of the site, the shoring should be strengthened to reduce the potential for movement of that foundation. We recommend that soldier piles be spaced no further than 6 feet on center in that area. Additionally, the shoring adjacent to the neighboring building should be designed to resist an at-rest soil pressure of 50 pcf, as well as a building surcharge. The magnitude of the surcharge will depend on the proximity of the shoring to the building and the weight of the building. We can work with the shoring designer during the shoring design phase to create an appropriate surcharge.

It is important that the shoring design provides sufficient working room to drill and install the soldier piles, without needing to make unsafe, excessively steep temporary cuts. Cut slopes should be planned to intersect the backside of the drilled holes, not the back of the lagging.

Lateral movement of the soldier piles below the excavation level will be resisted by an ultimate passive soil pressure equal to that pressure exerted by a fluid with a density of 500 pcf. No safety factor is included in the given value. This soil pressure is valid only for a level excavation in front of the soldier pile; it acts on two times the grouted pile diameter. Cut slopes made in front of shoring walls significantly decrease the passive resistance. This includes temporary cuts necessary to install internal braces or rakers. The minimum embedment below the floor of the excavation for cantilever soldier piles should be equal to the height of the "stick-up."

Excavation and Shoring Monitoring

As with any shoring system, there is a potential risk of greater-than-anticipated movement of the shoring and the ground outside of the excavation. This can translate into noticeable damage of surrounding on-grade elements, such as foundations and slabs. Therefore, we recommend making an extensive photographic and visual survey of the project vicinity, prior to demolition activities, installing shoring or commencing excavation. This documents the condition of buildings, pavements, and utilities in the immediate vicinity of the site in order to avoid, and protect the owner from, unsubstantiated damage claims by surrounding property owners.

Additionally, the shoring walls, and any adjacent foundations, should be monitored during construction to detect soil movements. To monitor their performance, we recommend establishing a series of survey reference points to measure any horizontal deflections of the shoring system. Control points should be established at a distance well away from the walls and slopes, and deflections from the reference points should be measured throughout construction by survey methods. At least two soldier piles should be monitored by taking readings at the top of the pile. Additionally, benchmarks installed on the surrounding buildings should be monitored for at least vertical movement. We suggest taking the readings at least once a week, until it is established that no deflections are occurring. The initial readings for this monitoring should be taken before starting any demolition or excavation on the site.

DRAINAGE CONSIDERATIONS

We anticipate that permanent foundation walls will be constructed against the shoring walls. Where this occurs, a plastic-backed drainage composite, such as Miradrain, Battledrain, or similar, should be placed against the entire surface of the shoring prior to pouring the foundation wall. Weep pipes located no more than 6 feet on-center should be connected to the drainage composite and poured into the foundation walls or the perimeter footing. A footing drain installed along the inside of the perimeter footing will be used to collect and carry the water discharged by the weep pipes to the storm system. Isolated zones of moisture or seepage can still reach the permanent wall where groundwater finds leaks or joints in the drainage composite. This is often an acceptable risk in unoccupied below-grade spaces, such as parking garages. However, formal waterproofing is typically necessary in areas where wet conditions at the face of the permanent wall will not be tolerable. If this is a concern, the permanent drainage and waterproofing system should be designed by a specialty consultant familiar with the expected subsurface conditions and proposed construction.

Footing drains placed inside the building or behind backfilled walls should consist of 4-inch, perforated PVC pipe surrounded by at least 6 inches of 1-inch-minus, washed rock wrapped in a non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the level of a crawl space or the bottom of a floor slab, and it should be sloped slightly for drainage. Plate 8 presents typical considerations for footing drains and Plate 9 presents a shoring drain detail. All roof and surface water drains must be kept separate from the foundation drain system.

If the structure includes an elevator, it may be necessary to provide special drainage or waterproofing measures for the elevator pit. If no seepage into the elevator pit is acceptable, it will be necessary to provide a footing drain and free-draining wall backfill, and the walls should be waterproofed. If the footing drain will be too low to connect to the storm drainage system, then it will likely be necessary to install a pumped sump to discharge the collected water. Alternatively, the elevator pit could be designed to be entirely waterproof; this would include designing the pit structure to resist hydrostatic uplift pressures.

As a minimum, a vapor retarder, as defined in the ***Slabs-On-Grade*** section, should be provided in any crawl space area to limit the transmission of water vapor from the underlying soils. Crawl space grades are sometimes left near the elevation of the bottom of the footings. As a result, an outlet drain is recommended for all crawl spaces to prevent an accumulation of any water that may bypass the footing drains. Providing even a few inches of free draining gravel underneath the vapor retarder limits the potential for seepage to build up on top of the vapor retarder.

No groundwater was observed during our field work. If seepage is encountered in an excavation, it should be drained from the site by directing it through drainage ditches, perforated pipe, or French drains, or by pumping it from sumps interconnected by shallow connector trenches at the bottom of the excavation.

The excavation and site should be graded so that surface water is directed off the site and away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to (a) building(s) should slope away at least 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. It is important that existing foundations be removed before site development. The stripped or removed materials should not be mixed with any materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not sufficiently compacted, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath footings, slabs or walkways	95%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

If grading activities take place during wet weather, or when the silty, on-site soil is wet, site preparation costs may be higher because of delays due to rain and the potential need to import granular fill. The on-site soil is generally silty and therefore moisture sensitive. Grading operations will be difficult during wet weather, or when the moisture content of this soil exceeds the optimum moisture content.

Moisture-sensitive soil may also be susceptible to excessive softening and "pumping" from construction equipment, or even foot traffic, when the moisture content is greater than the optimum moisture content. It may be beneficial to protect subgrades with a layer of imported sand or crushed rock to limit disturbance from traffic.

Structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the test borings are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test borings. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

This report has been prepared for the exclusive use of U District Investments, LLC and its representatives for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

In addition to reviewing the final plans, Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 7	Test Boring Logs
Plate 8	Typical Footing Drain Detail
Plate 9	Typical Shoring Drain Detail

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

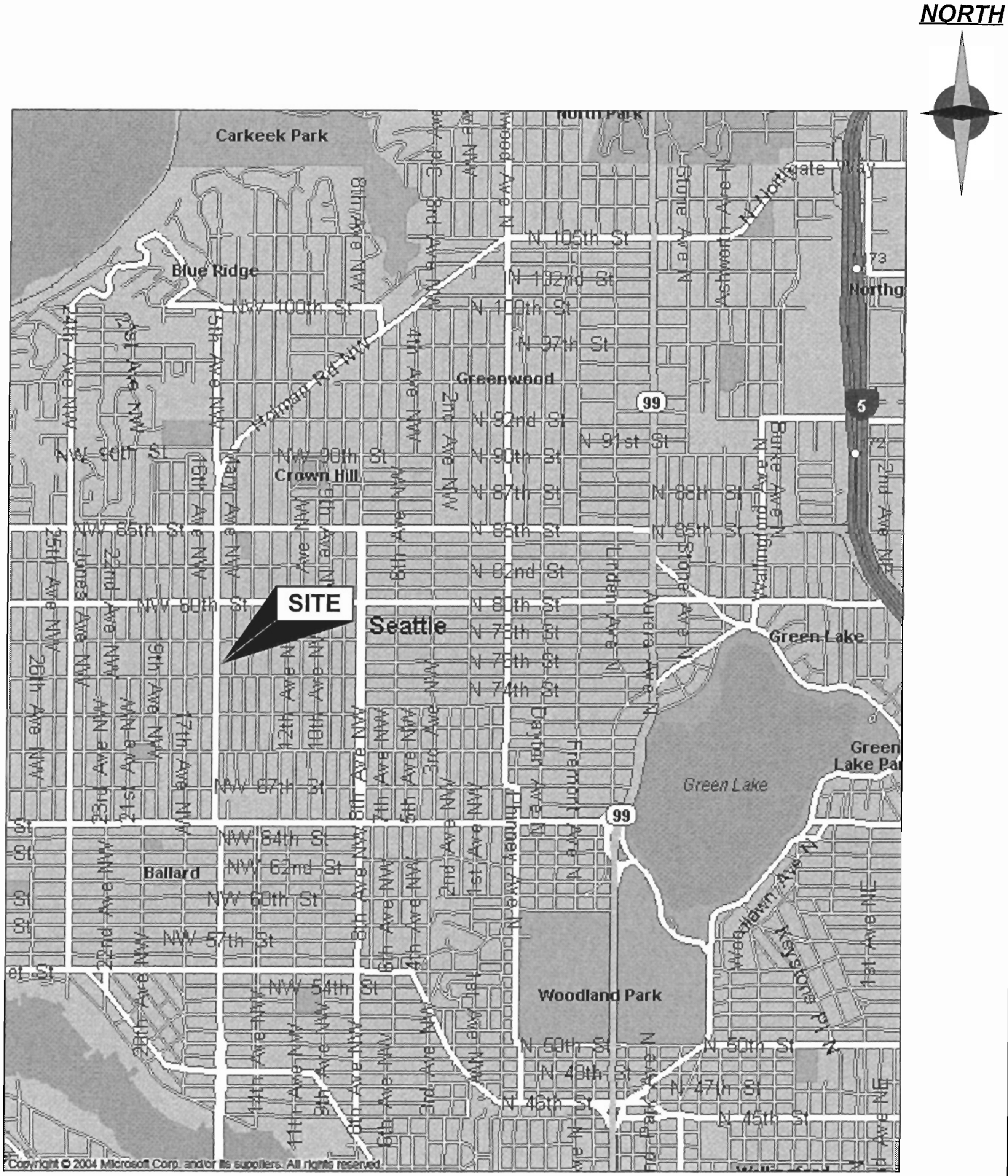
GEOTECH CONSULTANTS, INC.

Thor Christensen, P.E.
Senior Engineer

8/01/14

James H. Strange, Jr., P.E.
Associate

TRC/JHS:at



(Source: Microsoft Streets and Trips, 2004)

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VICINITY MAP

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job No:	Date:		Plate:
14187	June 2014		1

NORTH

Legend:

Test boring location

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SITE EXPLORATION PLAN

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job No:	Date:		Plate:
14187	June 2014	No Scale	2

BORING 1

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
						Gravel and topsoil over:
					SM	Gray silty SAND with gravel, fine to coarse-grained, moist, dense
5			37	1		-with a layer of sand, fine to coarse-grained
						Gray SAND with silt and gravel, fine to coarse-grained, moist, very dense
10			65	2	SW/SM	
						Gray SAND, fine to coarse-grained, moist, very dense
15			70	3		
					SW	
20						-becomes dense
			33	4		
25						

*** Test boring was terminated at 21.5 feet on June 5, 2014.**
*** No groundwater seepage was observed during drilling.**

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TEST BORING LOG

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job	Date:	Logged by:	Plate:
14187	June 2014	TRC	3

BORING 2

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
						Grass and topsoil over:
					SM	Gray SAND with silt and gravel and a layer of fine to coarse grained sand, fine to coarse grained, moist to wet, medium-dense
5			18	1		
10			75	2	SW/SM	Gray silty SAND with gravel, fine to coarse grained, moist, very dense
15			46	3	SW	Gray SAND, fine to coarse grained, moist, dense
20			68	4		
25						

*** Test boring was terminated at 21.5 feet on June 5, 2014.**
*** No groundwater seepage was observed during drilling.**

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TEST BORING LOG

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job	*Date:*	*Logged by:*	*Plate:*
14187	June 2014	TRC	4

BORING 3

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
						Grass and topsoil over;
					SM	Gray silty SAND with gravel and a layer of fine to coarse grained sand, fine to coarse grained, moist, medium-dense
5			27	1		
10			80/ 11.5"	2	SW SM	Gray SAND with silt and gravel, fine to coarse grained, moist, very dense
15			31	3	SW	Gray SAND, fine to coarse grained, moist to wet, dense
20			87/ 11.5"	4		-becomes very dense and moist
25						

*** Test boring was terminated at 21.5 feet on June 5, 2014.**
*** No groundwater seepage was observed during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job	Date:	Logged by:	Plate:
14187	June 2014	TRC	5

BORING 4

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
0 – 1.5						Grass and topsoil over;
1.5 – 8.5			23	1	SW/SM	Gray-brown SAND with gravel to silty SAND with gravel, fine to coarse grained, moist, medium-dense
8.5 – 13.5			54	2	SM	Gray silty SAND with gravel, fine to coarse grained, moist, very dense
13.5 – 21.5			63 87/ 11.5"	3 4	SW	Gray SAND, fine to coarse grained, moist

* **Test boring was terminated at 21.5 feet on June 5, 2014.**
* **No groundwater seepage was observed during drilling.**

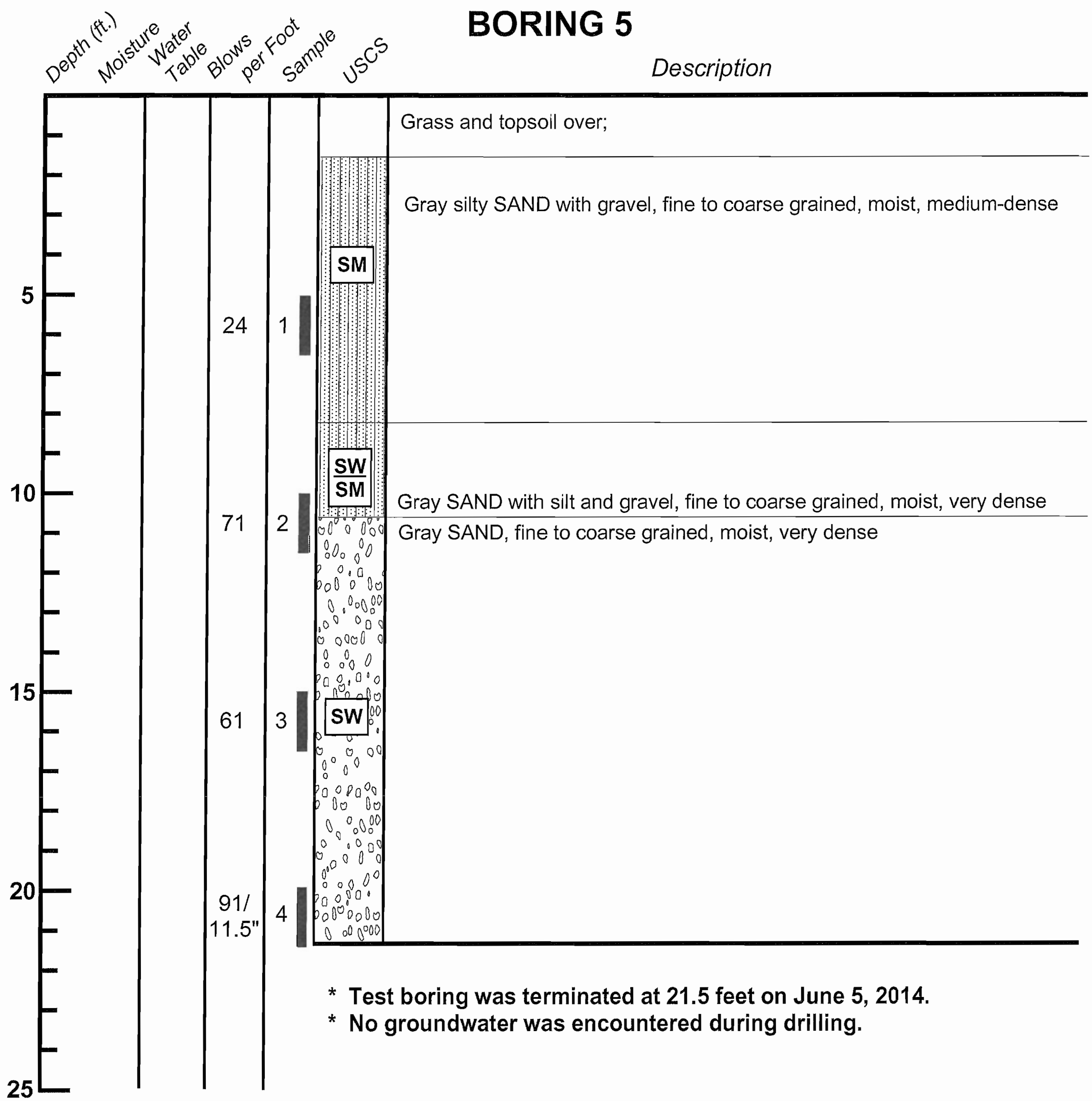
GEOTECH CONSULTANTS, INC.

TEST BORING LOG

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job	Date:	Logged by:	Plate:
14187	June 2014	TRC	6

BORING 5



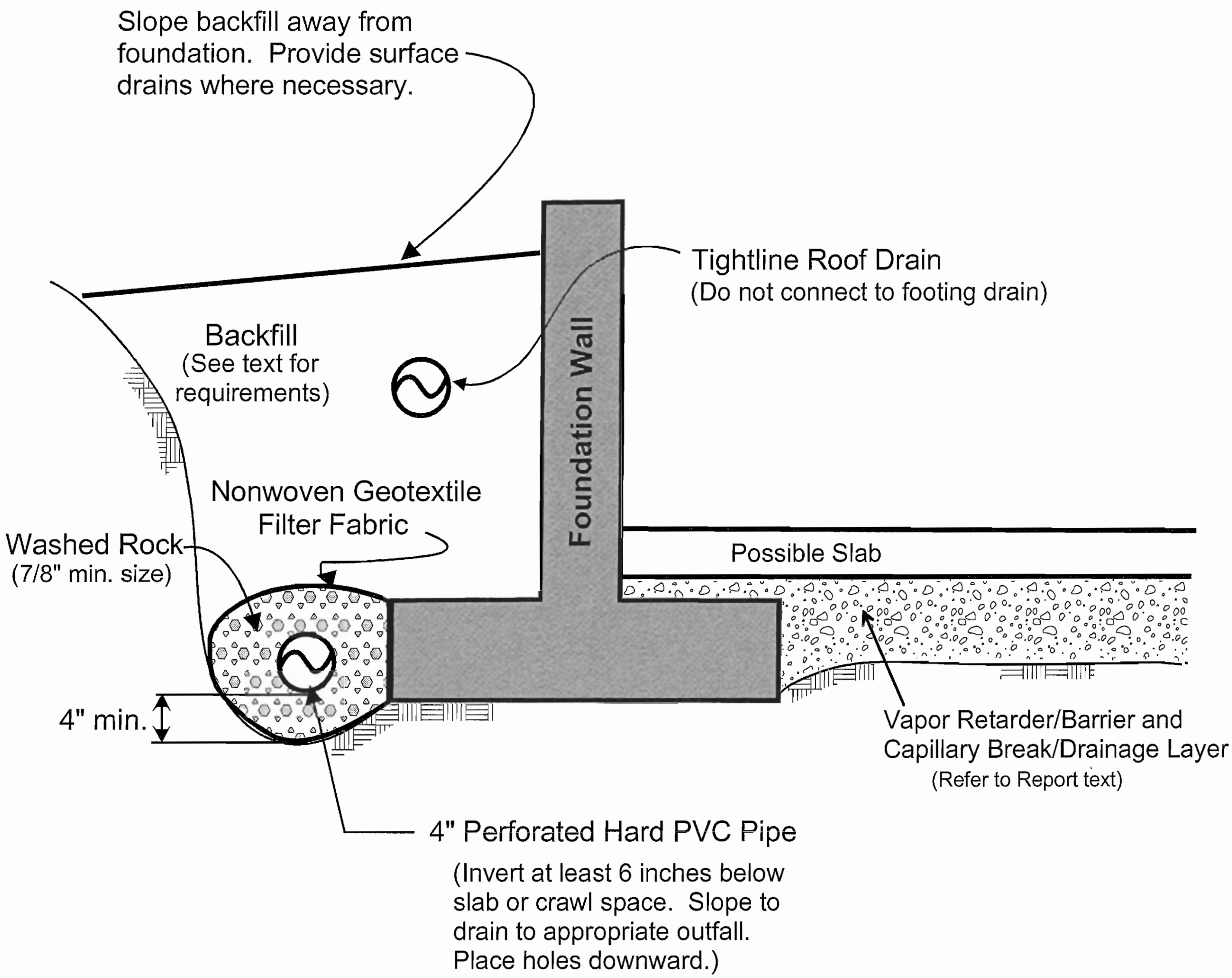
* **Test boring was terminated at 21.5 feet on June 5, 2014.**
* **No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job	Date:	Logged by:	Plate:
14187	June 2014	TRC	7



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

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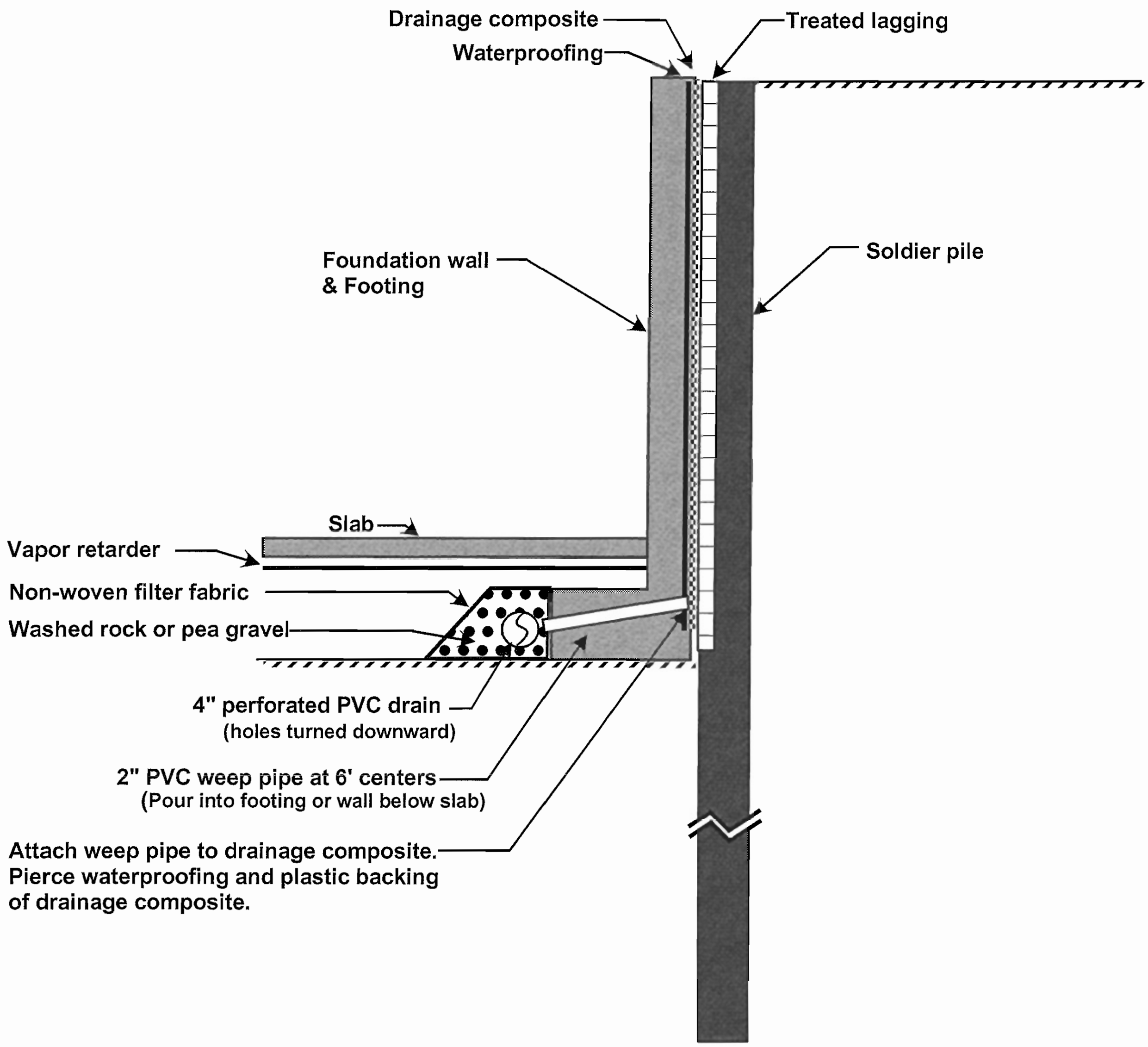
FOOTING DRAIN DETAIL

7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job No:	Date:		Plate:
14187	June 2014		8



<u>Note</u> - Refer to the report for additional considerations related to drainage and waterproofing.

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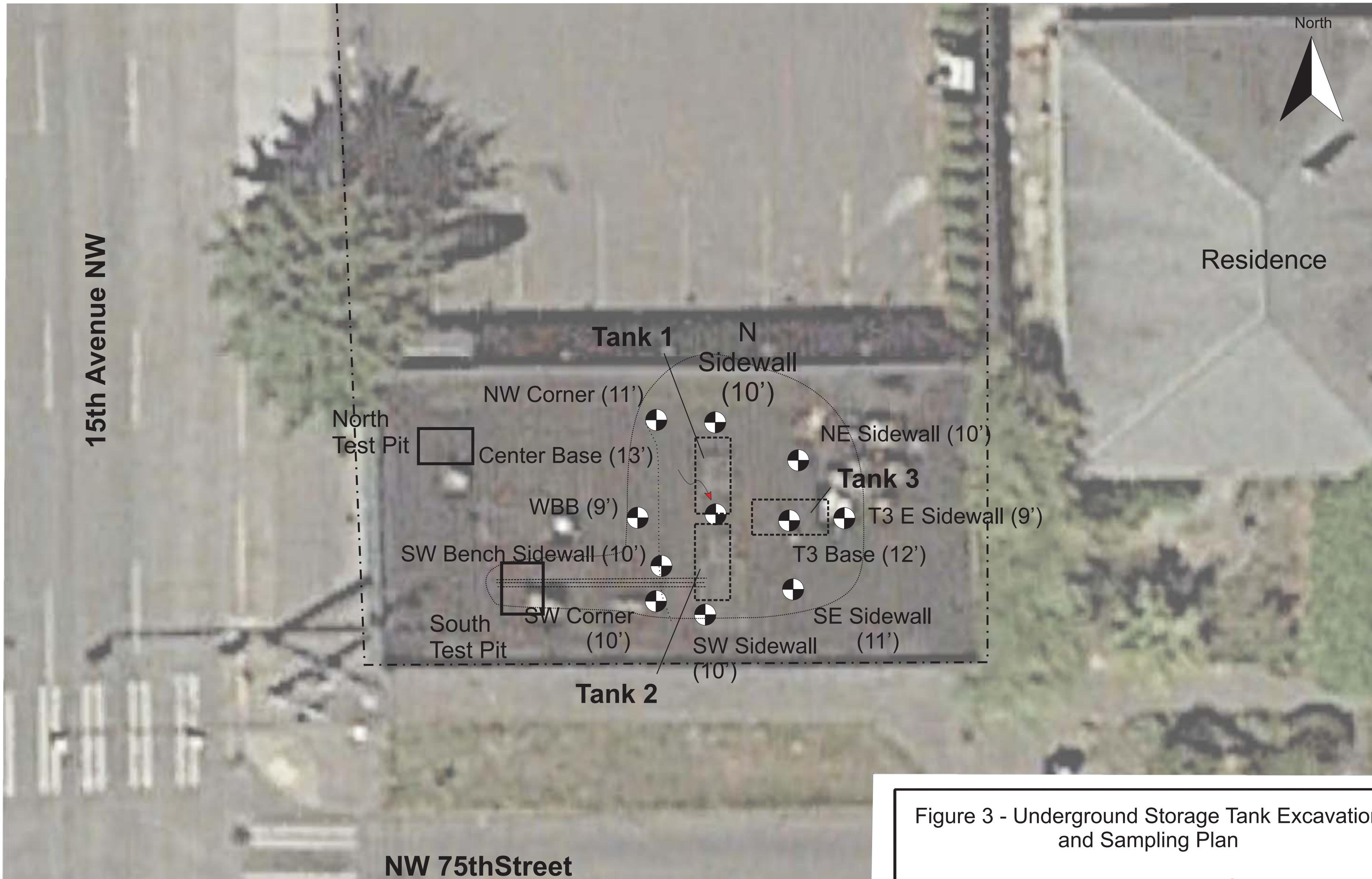
FOUNDATION DRAIN DETAIL
7514, 7518, & 7530 - 15th Avenue NW
Seattle, Washington

Job No:	Date:		Plate:
14187	June 2014		9



Legend

- Soil Sample from UST Excavation (Depth in Feet)
- Test Pit Locations

Aerial Photograph from Google Earth

0 15

1" = Approx. 15 Ft.

Figure 3 - Underground Storage Tank Excavation and Sampling Plan

Talta Ballard Project Site
7500 - 7530 15th Avenue NW
Seattle, Washington

Project No.	WES -1471A
Date	Jan 29, 2017
File ID.	1471AF4

WHITMAN
Environmental Sciences

North Donut Shop Test Pit - Approximately three feet deep

South Donut Shop Test Pit - Approximately four feet deep. Note product piping discovered in test pit, then excavated to the east, in foreground.