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April 29, 2016

Mr. Bob Ford
Tersa Tellus, Inc.
P.O. Box 1587
Monroe, Washington 98272

Geotechnical Engineering Evaluation
Tersa Tellus Chain Lake Road Residential Development
13407 Chain Lake Road
Monroe, Washington
NGA File No. 951316

Dear Mr. Ford:

We are pleased to submit the attached report titled "Geotechnical Engineering Evaluation – Tersa Tellus Chain Lake Road Residential Development – 13407 Chain Lake Road – Monroe, Washington." The parcel numbers for the properties included in this project are 28073100200900, 28073100100400, and 28073100200300. This report summarizes the existing surface and subsurface conditions within the site and provides recommendations for the proposed site development. Our services were completed in general accordance with our proposal signed by you on March 21, 2016.

We understand that the proposed development area consists of three separate parcels covering approximately 26.38 acres. The southwestern parcel is occupied by an existing manufactured home and other miscellaneous buildings. The larger northeastern parcel is currently occupied by a vacant residence, barn and miscellaneous outbuildings. The ground surface within the property is undulating but generally slopes gently from the northwest to the southeast throughout the site. We understand that proposed development plans consist of removing the existing structures and subdividing the property into approximately 88 new single-family residential lots, along with associated access roadways and underground utilities. Final development and grading plans have not been finalized at the time this report was prepared. Final stormwater plans have also not been developed. We should be retained to review final development plans, including plans for site grading, retaining walls, and drainage prior to construction.

We monitored the excavation of fourteen test pits at the site on April 15, 2016. Our explorations indicated that the site is underlain by competent, native glacial till soils, below a surficial layer of topsoil. It is our opinion from a geotechnical standpoint that the site is compatible with the planned development provided that our recommendations are incorporated into the design and construction of this project. We have recommended that the new structures be founded on the native medium dense or better native soil for bearing capacity and settlement considerations. These soils should generally be encountered approximately two to three feet below the existing ground surface, based on our explorations. However, deeper areas of loose soil and/or undocumented fill could also exist within unexplored areas of the site.

In the attached report, we have also provided general recommendations for site grading, slabs-on-grade, structural fill placement, retaining walls, erosion control, and drainage. We should be retained to review and comment on final development plans and observe the earthwork phase of construction.

It has been a pleasure to provide service to you on this project. Please contact us if you have any questions regarding this report or require further information.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Khaled M. Shawish, PE
Principal

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Geotechnical Engineering Evaluation
Tersa Tellus Chain Lake Road Residential Development
13407 Chain Lake Road
Monroe, Washington

INTRODUCTION

This report presents the results of our geotechnical engineering investigation and evaluation of the proposed Tersa Tellus Chain Lake Road Residential Development project in Monroe, Washington. The site is located at 13407 Chain Lake Road as shown on the Vicinity Map in Figure 1. The overall site is comprised of three separate properties with parcel numbers 28073100200900, 28073100100400, and 28073100200300. The purpose of this study is to explore and characterize the site's surface and subsurface conditions, and to provide geotechnical recommendations for site development.

The southwestern parcel is occupied by an existing manufactured home and other miscellaneous buildings. The larger northeastern parcel is currently occupied by a vacant residence, barn and miscellaneous outbuildings. The ground surface within the property is undulating but generally slopes gently from the northwest to the southeast throughout the site. We understand that proposed development plans consist of removing the existing structures and subdividing the property into approximately 88 new single-family residential lots, along with associated access roadways and underground utilities.

SCOPE

The purpose of this study is to explore and characterize the site surface and subsurface conditions, and provide general recommendations for site development. Specifically, our scope of services include the following:

1. Review available soil and geologic maps of the area.
2. Explore the subsurface soil and groundwater conditions within the site with trackhoe test pits. The backhoe/trackhoe was subcontracted by NGA.
3. Perform laboratory classification and analyses on soil samples obtained from the explorations, as necessary.
4. Provide recommendations for site grading and earthwork, including structural fill.
5. Provide recommendations for foundation support and slab-on-grade subgrade preparation.
6. Provide recommendations for temporary and permanent slopes.

7. Provide recommendations for retaining walls.

8. Provide recommendations for site drainage and erosion control.

9. Document the results of our findings, conclusions, and recommendations in a written geotechnical report.

SITE CONDITIONS

Surface Conditions

The site consists of three irregular-shaped parcels covering approximately 26.38 acres. The parcel within the southwestern portion of the site is currently occupied by a manufactured home and miscellaneous outbuildings while the northeastern parcel is occupied by a vacant residence, barn and miscellaneous outbuildings. The ground surface within the site is undulating by generally slopes gently from the northwest to the southeast throughout the site. The site is vegetated with grass, underbrush and young to mature trees. The site is bordered to the north, east, and south by residential properties and to the west by Chain Lake Road. We did not observe surface water within the development portion of the site during our visit on April 15, 2016. However, we did observe standing water within a designated wetland area within the northeastern portion of the site. The existing site conditions and planned lot layout are shown on the Site Plan in Figure 2.

Subsurface Conditions

Geology: The geologic units for this area are shown on the Preliminary Geologic Map of the Skykomish River 1:100,000 Quadrangle, Washington, by Tabor, R. W., Frizzell Jr., V. A., et al (USGS, 1982). The site is mapped as Till (Qvt). The Till unit is described as glacially transported silty sand with gravel. Our explorations generally encountered silty fine to medium sand with gravel consistent with the description of the Till.

Explorations: The subsurface conditions within the site were explored on April 15, 2016 by excavating fourteen test pits to depths ranging from 4.5 to 6.5 feet below the existing ground surface using a mini-trackhoe. The approximate locations of our explorations are shown on the Site Plan in Figure 2. A geologist from NGA was present during the explorations, examined the soils and geologic conditions encountered, obtained samples of the different soil types, and maintained logs of the test pits.

The soils were visually classified in general accordance with the Unified Soil Classification System, presented in Figure 3. The logs of our test pits are attached to this report and are presented as Figures 4

through 6. We present a brief summary of the subsurface conditions in the following paragraph. For a detailed description of the subsurface conditions, the logs of the test pits should be reviewed.

In all of our test pits, we encountered approximately 0.5 to 1.0 feet of surficial topsoil. Underlying the surficial topsoil in all of our test pits, we encountered approximately 1.5 to 4.0 feet of medium dense, brown silty fine to medium sand with gravel and varying amounts of cobbles underlain by dense to very dense, gray silty fine to medium sand with gravel. We interpreted these soils to be weathered and unweathered glacial till soils, respectively. All of the test pits were terminated within the unweathered glacial till soils at depths in the range of 4.5 to 6.5 feet below the existing ground surface, respectively.

Hydrogeologic Conditions

Groundwater seepage was gernerally not encountered in our explorations. However, we did encounter light to moderate groundwater seepage in Test Pits 11, 12, and 14 at depths in the range of 3.0 to 4.5 feet below the ground surface. We interpret this water to be perched water. Perched water occurs when surface water infiltrates through less dense, more permeable soils and accumulates on top of a relatively low permeability material. Perched water does not represent a regional groundwater "table" within the upper soil horizons. Perched water tends to vary spatially and is dependent upon the amount of rainfall. We would expect the amount of perched groundwater to decrease during drier times of the year and increase during wetter periods.

SENSITIVE AREA EVALUATION

Seismic Hazard

We reviewed the 2012 International Building Code (IBC) for seismic site classification for this project. Since medium dense or better glacial soils were generally encountered underlying the site at depth, the site conditions best fit the IBC description for Site Class D.

Hazards associated with seismic activity include liquefaction potential and amplification of ground motion. Liquefaction is caused by a rise in pore pressures in a loose, fine sand deposit beneath the groundwater table. It is our opinion that the competent glacial till material interpreted to underlie the site has a low potential for liquefaction or amplification of ground motion.

Erosion Hazard

The erosion hazard criteria used for determination of affected areas includes soil type, slope gradient, vegetation cover, and groundwater conditions. The erosion sensitivity is related to the vegetative cover

and the specific surface soil types, which are related to the underlying geologic soil units. The Soil Survey, Snohomish County Area, Washington, by the Soil Conservation Service (SCS) was reviewed to determine the erosion hazard of the on-site soils. The site surface soils were classified using the SCS classification system as Tokul gravelly medial loam, 0 to 8 percent slopes and is listed as having a slight erosion hazard if the soils are exposed.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion from a geotechnical standpoint that the site is compatible with the planned development. Our explorations indicated that the site is underlain by a surficial topsoil layer with competent glacial soils at relatively shallow depths. The native glacial soils should provide adequate support for foundation, slab, and pavement loads. We recommend that the new residences be designed utilizing shallow foundations. Footings should extend through any loose soil, and be founded on the underlying medium dense or better native soil, or structural fill extending to these soils. The competent soil should typically be encountered approximately two to three feet below the existing surface, based on our explorations. We should note that localized areas of deeper unsuitable soils and/or undocumented fill could be encountered in the unexplored areas of the site. This condition, if encountered, would require additional excavations in foundation, slab, and pavement areas to remove the unsuitable soils.

The surficial soils encountered on this site are considered moisture-sensitive and may disturb easily when wet. We recommend that construction take place during the drier summer months, if possible. If construction is to take place during wet weather, the soils may disturb and additional expenses and delays may be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls to protect exposed subgrades and construction traffic areas. Some of the native on-site soils may be suitable for use as structural fill depending on the moisture content of the soil during construction. This will depend on the moisture content of the soils at the time of construction. NGA should be retained to determine if the on-site soils can be used as structural fill material during construction.

Erosion Control

The erosion hazard for the on-site soils is interpreted to be slight for exposed soils, but actual erosion potential will be dependent on how the site is graded and how water is allowed to concentrate. Best Management Practices (BMPs) should be used to control erosion. Areas disturbed during construction should be protected from erosion. Erosion control measures may include diverting surface water away

from the stripped or disturbed areas. Silt fences and/or straw bales should be erected to prevent muddy water from leaving the site. Disturbed areas should be planted as soon as practical and the vegetation should be maintained until it is established. The erosion potential of areas not stripped of vegetation should be low.

Site Preparation and Grading

After erosion control measures are implemented, site preparation should consist of stripping the topsoil and loose soils from foundation, slab, pavement areas, and other structural areas, to expose medium dense or better native soils. The stripped soil should be removed from the site or stockpiled for later use as a landscaping fill. Based on our observations, we anticipate general stripping depths of one to two feet across the site. However, additional stripping may be required if areas of undocumented fill and/or loose soil are encountered in unexplored areas of the site.

After site stripping, if the exposed subgrade is deemed loose, it should be compacted to a non-yielding condition and then proof-rolled with a heavy rubber-tired piece of equipment. Areas observed to pump or weave during the proof-roll test should be reworked to structural fill specifications or over-excavated and replaced with properly compacted structural fill or rock spalls. If loose soils are encountered in the pavement areas, the loose soils should be removed and replaced with rock spalls or granular structural fill. If significant surface water flow is encountered during construction, this flow should be diverted around areas to be developed, and the exposed subgrades should be maintained in a semi-dry condition.

If wet conditions are encountered, alternative site stripping and grading techniques might be necessary. These could include using large excavators equipped with wide tracks and a smooth bucket to complete site grading and covering exposed subgrade with a layer of crushed rock for protection. If wet conditions are encountered or construction is attempted in wet weather, the subgrade should not be compacted as this could cause further subgrade disturbance. In wet conditions it may be necessary to cover the exposed subgrade with a layer of crushed rock as soon as it is exposed to protect the moisture sensitive soils from disturbance by machine or foot traffic during construction. The prepared subgrade should be protected from construction traffic and surface water should be diverted around areas of prepared subgrade.

The site soils are considered to be moisture-sensitive and may disturb when wet. We recommend that construction take place during the drier summer months if possible. However, if construction takes place during the wet season, additional expenses and delays should be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls on exposed subgrades,

construction traffic areas, and paved areas prior to placing structural fill. Wet weather grading will also require additional erosion control and site drainage measures. Some of the on-site soils may be suitable for use as structural fill, depending on the moisture content of the soil at the time of construction. NGA should be retained to evaluate the suitability of all on-site and imported structural fill material during construction.

Temporary and Permanent Slopes

Temporary cut slope stability is a function of many factors, including the type and consistency of soils, depth of the cut, surcharge loads adjacent to the excavation, length of time a cut remains open, and the presence of surface or groundwater. It is exceedingly difficult under these variable conditions to estimate a stable, temporary, cut slope angle. Therefore, it should be the responsibility of the contractor to maintain safe slope configurations at all times as indicated in OSHA guidelines for cut slopes.

The following information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that Nelson Geotechnical Associates, Inc. assumes responsibility for job site safety. Job site safety is the sole responsibility of the project contractor.

For planning purposes, we recommend that temporary cuts in the on-site soils be no steeper than 1.5 Horizontal to 1 Vertical (1.5H:1V). If significant groundwater seepage or surface water flow were encountered, we would expect that flatter inclinations would be necessary. We recommend that cut slopes be protected from erosion. The slope protection measures may include covering cut slopes with plastic sheeting and diverting surface runoff away from the top of cut slopes. We do not recommend vertical slopes for cuts deeper than four feet, if worker access is necessary. We recommend that cut slope heights and inclinations conform to appropriate OSHA/WISHA regulations.

Permanent cut and fill slopes should be no steeper than 2H:1V. However, flatter inclinations may be required in areas where loose soils are encountered. Permanent slopes should be vegetated and the vegetative cover maintained until established.

Foundations

Conventional shallow spread foundations should be placed on medium dense or better native soils, or be supported on structural fill or rock spalls extending to those soils. Medium dense soils should be encountered approximately two to three feet below ground surface based on our explorations. Where undocumented fill or less dense soils are encountered at footing bearing elevation, the subgrade should be

over-excavated to expose suitable bearing soil. The over-excavation may be filled with structural fill, or the footing may be extended down to the competent native soils. If footings are supported on structural fill, the fill zone should extend outside the edges of the footing a distance equal to one half of the depth of the over-excavation below the bottom of the footing.

Footings should extend at least 18 inches below the lowest adjacent finished ground surface for frost protection and bearing capacity considerations. Foundations should be designed in accordance with the 2012 IBC. Footing widths should be based on the anticipated loads and allowable soil bearing pressure. Water should not be allowed to accumulate in footing trenches. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend an allowable design bearing pressure of not more than 2,500 pounds per square foot (psf) be used for the design of footings founded on the medium dense or better native soils or structural fill extending to the competent native material. The foundation bearing soil should be evaluated by a representative of NGA. We should be consulted if higher bearing pressures are needed. Current IBC guidelines should be used when considering increased allowable bearing pressure for short-term transitory wind or seismic loads. Potential foundation settlement using the recommended allowable bearing pressure is estimated to be less than 1-inch total and ½-inch differential between adjacent footings or across a distance of about 20 feet, based on our experience with similar projects.

Lateral loads may be resisted by friction on the base of the footing and passive resistance against the subsurface portions of the foundation. A coefficient of friction of 0.35 may be used to calculate the base friction and should be applied to the vertical dead load only. Passive resistance may be calculated as a triangular equivalent fluid pressure distribution. An equivalent fluid density of 200 pounds per cubic foot (pcf) should be used for passive resistance design for a level ground surface adjacent to the footing. This level surface should extend a distance equal to at least three times the footing depth. These recommended values incorporate safety factors of 1.5 and 2.0 applied to the estimated ultimate values for frictional and passive resistance, respectively. To achieve this value of passive resistance, the foundations should be poured “neat” against the native medium dense soils or compacted fill should be used as backfill against the front of the footing. We recommend that the upper one foot of soil be neglected when calculating the passive resistance.

Retaining Walls

Specific grading plans for this project were not available at the time this report was prepared, but retaining walls may be incorporated into project plans. In general, the lateral pressure acting on subsurface retaining walls is dependent on the nature and density of the soil behind the wall, the amount of lateral wall movement which can occur as backfill is placed, wall drainage conditions, and the inclination of the backfill. For walls that are free to yield at the top at least one thousandth of the height of the wall (active condition), soil pressures will be less than if movement is limited by such factors as wall stiffness or bracing (at-rest condition). We recommend that walls supporting horizontal backfill and not subjected to hydrostatic forces, be designed using a triangular earth pressure distribution equivalent to that exerted by a fluid with a density of 35 pcf for yielding (active condition) walls, and 55 pcf for non-yielding (at-rest condition) walls.

These recommended lateral earth pressures are for a drained granular backfill and are based on the assumption of a horizontal ground surface behind the wall for a distance of at least the subsurface height of the wall, and do not account for surcharge loads. Additional lateral earth pressures should be considered for surcharge loads acting adjacent to subsurface walls and within a distance equal to the subsurface height of the wall. This would include the effects of surcharges such as traffic loads, floor slab loads, slopes, or other surface loads. We could consult with the structural engineer regarding additional loads on retaining walls during final design, if needed.

The lateral pressures on walls may be resisted by friction between the foundation and subgrade soil, and by passive resistance acting on the below-grade portion of the foundation. Recommendations for frictional and passive resistance to lateral loads are presented in the **Foundations** subsection of this report.

All wall backfill should be well compacted as outlined in the **Structural Fill** subsection of this report. Care should be taken to prevent the buildup of excess lateral soil pressures due to over-compaction of the wall backfill. This can be accomplished by placing wall backfill in 8-inch loose lifts and compacting the backfill with small, hand-operated compactors within a distance behind the wall equal to at least one-half the height of the wall. The thickness of the loose lifts should be reduced to accommodate the lower compactive energy of the hand-operated equipment. The recommended level of compaction should still be maintained.

Permanent drainage systems should be installed for retaining walls. Recommendations for these systems are found in the **Subsurface Drainage** subsection of this report. We recommend that we be retained to evaluate the proposed wall drain backfill material and observe installation of the drainage systems.

Structural Fill

General: Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the **Site Preparation and Grading** subsection prior to beginning fill placement.

Materials: Structural fill should consist of a good quality, granular soil, free of organics and other deleterious material, and be well graded to a maximum size of about three inches. All-weather fill should contain no more than five-percent fines (soil finer than U.S. No. 200 sieve, based on that fraction passing the U.S. 3/4-inch sieve). Some of the more granular on-site soils may be suitable for use as structural fill depending on the moisture content of the soil during construction. We should be retained to evaluate all proposed structural fill material prior to placement.

Fill Placement: Following subgrade preparation, placement of structural fill may proceed. All filling should be accomplished in uniform lifts up to eight inches thick. Each lift should be spread evenly and be thoroughly compacted prior to placement of subsequent lifts. All structural fill underlying building areas and pavement subgrade should be compacted to a minimum of 95 percent of its maximum dry density. Maximum dry density, in this report, refers to that density as determined by the ASTM D-1557 Compaction Test procedure. The moisture content of the soils to be compacted should be within about two percent of optimum so that a readily compactable condition exists. It may be necessary to over-excavate and remove wet soils in cases where drying to a compactable condition is not feasible. All compaction should be accomplished by equipment of a type and size sufficient to attain the desired degree of compaction.

Slab-on-Grade

Slabs-on-grade should be supported on subgrade soils prepared as described in the **Site Preparation and Grading** subsection of this report. We recommend that all floor slabs be underlain by at least six inches

of free-draining gravel with less than three percent by weight of the material passing Sieve #200 for use as a capillary break. We recommend that the capillary break be hydraulically connected to the footing drain system to allow free drainage from under the slab. A suitable vapor barrier, such as heavy plastic sheeting (6-mil minimum), should be placed over the capillary break material. An additional 2-inch-thick moist sand layer may be used to cover the vapor barrier. This sand layer may be used to protect the vapor barrier membrane and to aid in curing the concrete.

Pavements

Pavement subgrade preparation, and structural filling where required, should be completed as recommended in the **Site Preparation and Grading** and **Structural Fill** subsections of this report. The pavement subgrade should be proof-rolled with a heavy, rubber-tired piece of equipment, to identify soft or yielding areas that require repair. We should be retained to observe the proof-rolling and recommend repairs prior to placement of the asphalt or hard surfaces.

Utilities

We recommend that underground utilities be bedded with a minimum 12 inches of pea gravel prior to backfilling the trench with on-site or imported material. Trenches within settlement sensitive areas should be compacted to 95% of the modified proctor as described in the **Structural Fill** subsection of this report. Trenches located in non-structural areas should be compacted to a minimum 90% of the maximum dry density.

Site Drainage

Surface Drainage: The finished ground surface should be graded such that stormwater is directed to an appropriate stormwater collection system. Water should not be allowed to stand in any areas where footings, slabs, or pavements are to be constructed. Final site grades should allow for drainage away from the residences. We suggest that the finished ground be sloped at a minimum gradient of three percent, for a distance of at least 10 feet away from the residences. Surface water should be collected by permanent catch basins and drain lines, and be discharged into an appropriate discharge system. The overflow water should be dispersed to discharge into an appropriate location.

Subsurface Drainage: If groundwater is encountered during construction, we recommend that the contractor slope the bottom of the excavation and collect the water into ditches and small sump pits where the water can be pumped out and routed into a permanent storm drain.

We recommend the use of footing drains around the structures. Footing drains should be installed at least one foot below planned finished floor elevation. The drains should consist of a minimum 4-inch-diameter, rigid, slotted or perforated, PVC pipe surrounded by free-draining material wrapped in a filter fabric. We recommend that the free-draining material consist of an 18-inch-wide zone of clean (less than three-percent fines), granular material placed along the back of walls. Pea gravel is an acceptable drain material. The free-draining material should extend up the wall to one foot below the finished surface. The top foot of backfill should consist of impermeable soil placed over plastic sheeting or building paper to minimize surface water or fines migration into the footing drain. Footing drains should discharge into tightlines leading to an appropriate collection and discharge point with convenient cleanouts to prolong the useful life of the drains. Roof drains should not be connected to wall or footing drains.

CONSTRUCTION MONITORING

We should be retained to provide construction monitoring services during the earthwork phase of the project to evaluate subgrade conditions, temporary cut conditions, fill compaction, and drainage system installation.

USE OF THIS REPORT

NGA has prepared this report Mr. Bob Ford and his agents for use in the planning and design of the development on this site only. The scope of our work does not include services related to construction safety precautions and our recommendations are not intended to direct the contractors' methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. There are possible variations in subsurface conditions between the explorations and also with time. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. A contingency for unanticipated conditions should be included in the budget and schedule.

We recommend that NGA be retained to provide monitoring and consultation services during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork and foundation installation activities comply with contract plans and specifications. We should be contacted a minimum of one week prior to construction activities and could attend pre-construction meetings if requested.

Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this report was

prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

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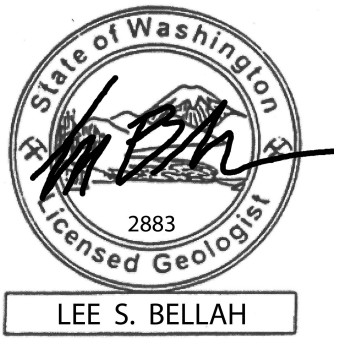
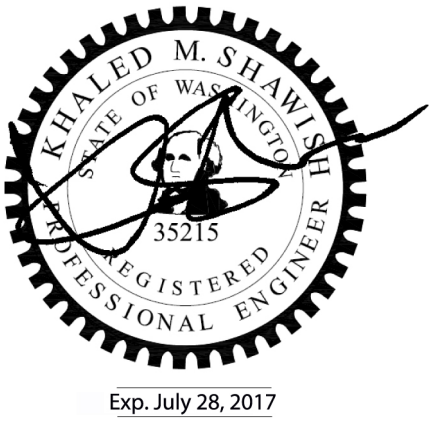
It has been a pleasure to provide service to you on this project. If you have any questions or require further information, please call.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.



Lee S. Bellah, LG
Project Geologist



Khaled M. Shawish
Principal

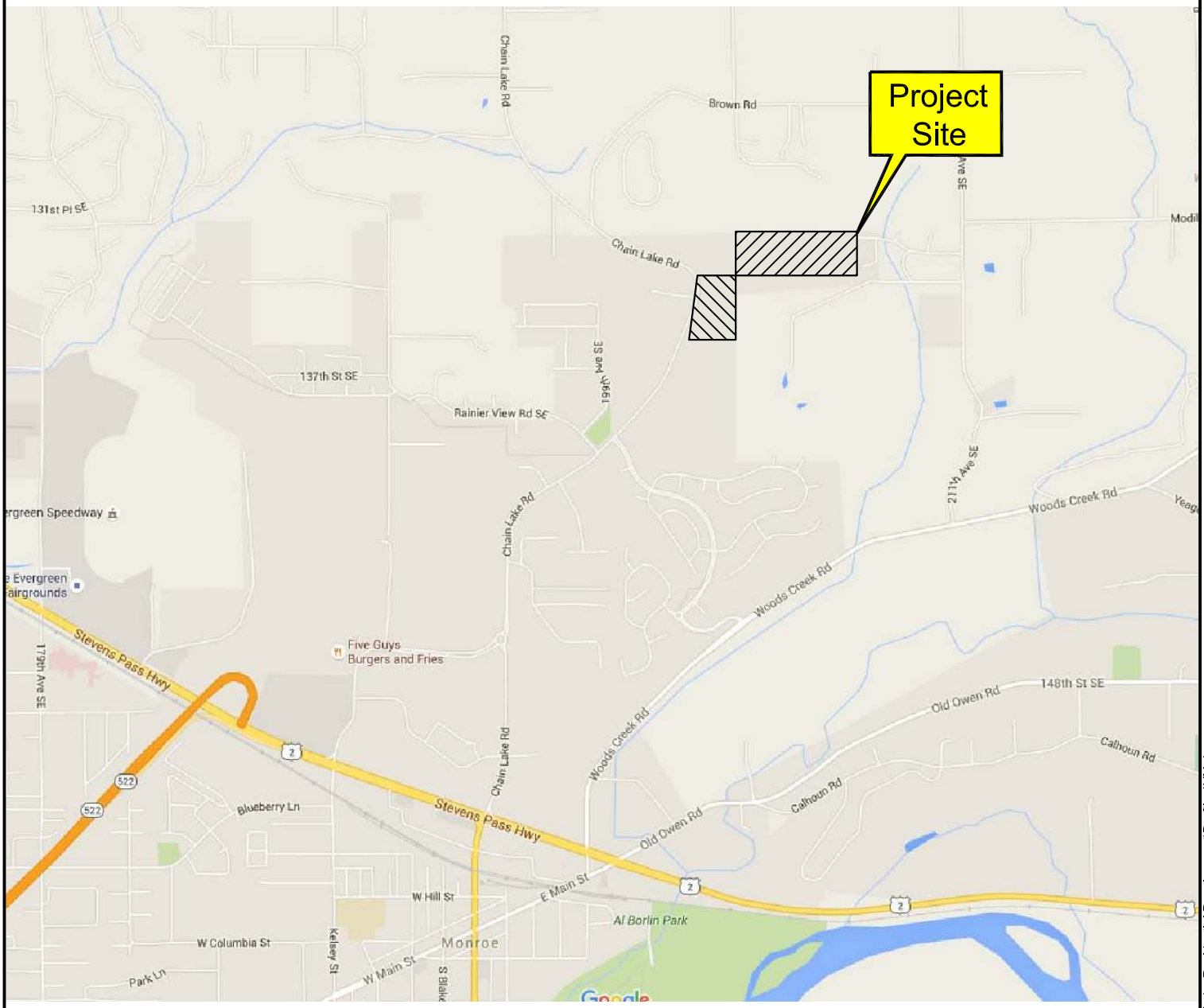
LSB:KMS:dy

Seven Figures Attached

VICINITY MAP

Not to Scale

N



Monroe, WA

Project Number 951316	Tersa Tellus Development Vicinity Map	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	No.	Date	Revision	By	CK
Figure 1		17311-135th Ave. NE, A-500 Woodinville, WA 98072 (425) 486-1669 / Fax 481-2510 Snohomish County (425) 339-1669 Wenatchee/Chelan (509) 665-7696 www.nelsongeotech.com	1	4/29/26	Original	DPN	LSB

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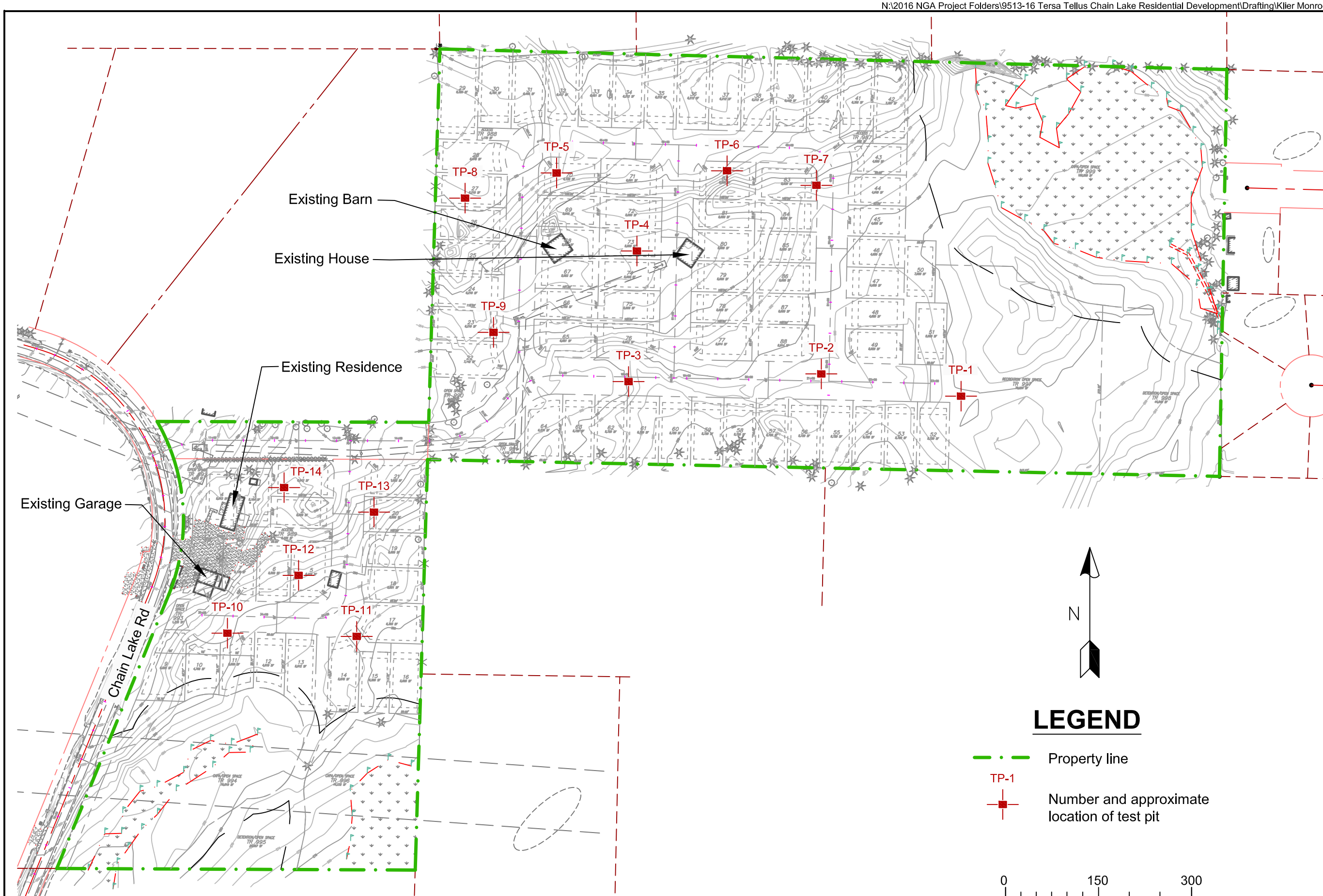

Reference: Site Plan based on a plan dated December 30, 2015, titled "Tersa Tellus, Inc. - Klier Property," prepared by LDC.

No.	Date	Revision	By	CK
1	4/29/16	Original	DPN	LSB

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Tersa Tellus Development
Site Plan

Project Number
951316

Figure 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE - GRAINED SOILS MORE THAN 50 % RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50 % OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50 % OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE - GRAINED SOILS MORE THAN 50 % PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50 %	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 % OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FLAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1) Field classification is based on visual examination of soil in general accordance with ASTM D 2488-93.

2) Soil classification using laboratory tests is based on ASTM D 2488-93.

3) Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water.

Wet - Visible free water or saturated, usually soil is obtained from below water table

Project Number 951316	Tersa Tellus Development Soil Classification Chart	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	No.	Date	Revision	By	CK
Figure 3		17311-135th Ave. NE, A-500 Woodinville, WA 98072 (425) 486-1669 / Fax 481-2510 Snohomish County (425) 337-1669 Wenatchee/Chelan (509) 665-7696 www.nelsongeotech.com	1	4/29/16	Original	DPN	LSB

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LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT ONE		
0.0 – 0.5		TOPSOIL
0.5 – 3.5	SM	BROWN GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
3.5 – 5.5	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		SAMPLES WERE COLLECTED AT 3.0 AND 5.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT MET REFUSAL AT 5.5 FEET ON 4/15/16
TEST PIT TWO		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN-GRAY SILTY FINE SAND WITH TRACE GRAVEL (MEDIUM DENSE, MOIST)
2.5 – 6.5	SM	GRAY SILTY FINE SAND WITH GRAVEL (DENSE, MOIST)
		SAMPLES WERE COLLECTED AT 3.0 AND 5.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 6.5 FEET ON 4/15/16
TEST PIT THREE		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN-GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL AND COBBLES (MEDIUM DENSE, MOIST)
2.5 – 6.5	SM	GRAY SILTY FINE TO COARSE SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 3.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 6.0 FEET ON 4/15/16
TEST PIT FOUR		
0.0 – 0.5		TOPSOIL
0.5 – 2.0	SM	BROWN-GRAY SILTY FINE TO COARSE SAND WITH GRAVEL AND COBBLES (MEDIUM DENSE, MOIST)
2.0 – 4.5	SM	GRAY SILTY FINE TO COARSE SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 3.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT MET REFUSAL AT 4.5 FEET ON 4/15/16

LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT FIVE		
0.0 – 0.5		TOPSOIL
0.5 – 2.0	SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
2.0 – 4.5	SM	GRAY FINE TO COARSE SAND WITH SILT AND GRAVEL (DENSE TO VERY DENSE, MOIST)
4.5 – 6.0	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLES COLLECTED AT 3.0 AND 6.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 6.0 FEET ON 4/15/16
TEST PIT SIX		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN-GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
2.5 – 5.5	SM	GRAY SILTY FINE SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 3.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 5.5 FEET ON 4/15/16
TEST PIT SEVEN		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN-GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
2.5 – 4.5	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 4.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 4.5 FEET ON 4/15/16
TEST PIT EIGHT		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN-GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
2.5 – 4.5	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		NO SAMPLE(S) COLLECTED GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED

LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
		TEST PIT COMPLETED AT 4.5 FEET ON 4/15/16
TEST PIT NINE		
0.0 – 0.5		TOPSOIL
0.5 – 2.5	SM	BROWN SILTY FINE TO COARSE SAND WITH GRAVEL AND COBBLES (MEDIUM DENSE, MOIST)
2.5 – 4.5	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 4.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 4.5 FEET ON 4/15/16
TEST PIT TEN		
0.0 –1.0		TOPSOIL
1.0 – 2.5	SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
2.5 – 5.0	SM	GRAY SILTY FINE TO COARSE SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 4.0 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 5.0 FEET ON 4/15/16
TEST PIT ELEVEN		
0.0 – 1.0		TOPSOIL
1.0 – 3.0	SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL AND COBBLES (MEDIUM DENSE, MOIST TO WET)
3.0 – 5.0	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 4.0 FEET GROUNDWATER SEEPAGE ENCOUNTERED AT 3.0 FEET TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 5.0 FEET ON 4/15/16

LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT TWELVE		
0.0 – 1.0		TOPSOIL
1.0 – 3.0	SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
3.0 – 4.5	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 3.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 4.5 FEET ON 4/15/16
TEST PIT THIRTEEN		
0.0 – 0.5		TOPSOIL
0.5 – 4.0	SM	BROWN-GRAY SILTY FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
4.0 – 6.0	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL AND COBBLES (DENSE TO VERY DENSE, MOIST)
		SAMPLE COLLECTED AT 3.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 6.0 FEET ON 4/15/16
TEST PIT FOURTEEN		
0.0 – 0.5		TOPSOIL
0.5 – 3.5	SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
3.5 – 6.0	SM	GRAY SILTY FINE TO MEDIUM SAND WITH GRAVEL (DENSE TO VERY DENSE, MOIST)
		NO SAMPLE(S) COLLECTED MODERATE GROUNDWATER SEEPAGE ENCOUNTERED AT 3.5 FEET TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT COMPLETED AT 6.0 FEET ON 4/15/16