GEOTECHNICAL
ENGINEERING EVALUATION
XPRESS LUBE/EXPRESSO
ARLINGTON, WASHINGTON
PREPARED FOR
MR. KEVIN McALLISTER
AND MR. TIM KAINTZ

NELSON GEOTECHNICAL ASSOCIATES, INC.
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March 21, 2008

Mr. Kevin McAllister and Tim Kaintz
10119 North Davies Road
Lake Stevens, Washington 98258

Geotechnical Engineering Evaluation
Xpress Lube/Espresso
Arlington, Washington
NGA File No. 783208

Dear Mr. McAllister and Mr. Kaintz:

We are pleased to submit the attached report titled "Geotechnical Engineering Evaluation – Xpress Lube/Espresso – Arlington, Washington." This report summarizes the existing surface and subsurface conditions within the site and provides general recommendations for the proposed site development. Our services were completed in general accordance with the proposal signed by Kevin McAllister on February 21, 2008.

An existing espresso stand with paved parking currently occupies the western portion of the property. Development plans include the construction of a new building with slab-on-grade and underground service bays on the eastern portion of the property. Cuts on the order of 8 to 10 feet will be needed for the underground service bays. The proposed building area is currently vacant and is vegetated with grass and scotch broom. Stormwater handling is planned to be directed into an on-site infiltration system.

We monitored the excavation of two test pits in the planned improvement area. Our explorations indicate that the site is generally underlain by competent glacial outwash soil at depth. We have concluded that the site is generally compatible with the planned improvements. We have recommended that the foundation for the new structure be founded on the underlying medium dense or better native soil for bearing capacity and settlement considerations. These soils should generally be encountered approximately one to three feet below the existing ground surface, based on our explorations.

Stormwater is planned to be directed to an on-site infiltration system. However, we encountered groundwater at a shallow depth, which may impact system design. Our recommendations for the infiltration system are discussed in the attached report. Also, the shallow groundwater will be a factor when excavating for the underground pits. Dewatering of the area may be needed, depending on actual groundwater elevations. Also, the underground pits will need to be designed to withstand buoyancy and hydrostatic forces. We have also included recommendations for site grading, foundation support, and site drainage.

We appreciate the opportunity to be of 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, P.E.
Principal

Three Copies Submitted

cc: Rick Fletcher – PugetWest Construction (one copy)

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Xpress Lube/Espresso
Arlington, Washington

INTRODUCTION

This report presents the results of our geotechnical engineering investigation and evaluation of the proposed Xpress Lube/Espresso project located at 16831 Smokey Point Boulevard in Arlington, Washington as shown on the Vicinity Map in Figure 1. 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. For our use in preparing this report, we were provided with a site plan titled "Xpress Lube/Espresso – Proposed Site Plan – Arlington, WA," dated January 2008, prepared by Sound Design Engineering, Inc. showing the existing and planned improvements.

An espresso stand currently occupies the western portion of the property. Development plans include the construction of a new express lube center with slab-on-grade and underground service bays in the vacant area east of the existing espresso stand. Cuts on the order of 8 to 10 feet will be needed for the underground service bays. Stormwater is planned to be directed into an on-site infiltration system. The proposed site layout is shown on the Site Plan in Figure 2.

SCOPE

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

1. Review existing soil and geologic maps of the area.
2. Explore the site subsurface soil and groundwater conditions with trackhoe-excavated test pits. Mini-trackhoe was supplied by the owner.
3. Install up to three piezometers to monitor groundwater elevations, as required by the City of Arlington.
4. Perform laboratory classification and analyses on selected soils samples obtained in the explorations, as necessary.
5. Provide recommendations for site grading and earthwork, including structural fill placement and compaction.
6. Provide recommendations for temporary slopes.
7. Provide recommendations for foundation support and slabs-on-grade.
8. Provide recommendations for pavement subgrade preparation.

9. Provide recommendations for stormwater infiltration per 2005 DOE Stormwater Management in Western Washington manual.
10. Provide recommendations for site drainage and erosion control.
11. Document the results of our explorations, findings, conclusions, and recommendations in a written geotechnical engineering report.

SITE CONDITIONS

Surface Conditions

The property is rectangular-shaped and is approximately 0.37 acres in size. The western portion of the property is currently occupied by an espresso stand and associated paving. The new development is planned in the eastern portion of the property. The new improvements area is currently unoccupied and vegetated with grass and scotch broom. The property is bordered to the north and east by vacant property, to the south by a restaurant, and to the west by Smokey Point Boulevard. We did not observe standing water during our site visit on Monday, February 25, 2008.

Subsurface Conditions

Geology: The geologic units for this site are shown on the Geologic Map of the Arlington West Quadrangle, Snohomish County, Washington, by James P. Minard (USGS 1985). The site is mapped as recessional outwash (Qvr), and more specifically the Marysville Sand member (Qvrm). The Marysville Sand member is described as clean sand with some fine gravel and areas of silt and clay. Our explorations encountered sand with gravel generally consistent with recessional outwash.

Explorations: The subsurface conditions within the site were explored on February 25, 2008 by excavating two test pits to depths ranging from 8.1 to 9.0 feet below the existing ground surface using a 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 Figure 4. We present a brief summary of the subsurface conditions in the following paragraphs. For a detailed description of the subsurface conditions, the logs of the test pits should be reviewed.

Below a surficial layer of grass in Test Pit 1, we encountered approximately 0.4 feet of loose to medium dense, dark brown, silty fine sand, which we interpreted to be topsoil. Below the topsoil, we encountered approximately 3.0 feet of medium dense to dense, orange-brown, silty fine sand, which we interpreted to be weathered outwash. Below the weathered outwash, we encountered medium dense to dense gray fine to medium sand with silt and varying amounts of gravel, which we interpreted to be native recessional outwash. Test Pit 1 was terminated in the recessional outwash at a depth of 9.0 feet below the existing ground surface.

Below a surficial layer of gravel in Test Pit 2, we encountered approximately 0.5 feet of loose to medium dense, dark brown, silty fine sand, which we interpreted to be topsoil. In the southwest corner of the test pit, we encountered up to approximately 2.8 feet of dark brown silty fine sand, which we interpreted to be modified ground. Below the topsoil, we encountered approximately 0.5 feet of medium dense to dense, orange-brown, silty fine sand. Below the orange-brown silty sand, we encountered approximately 1.5 feet of medium dense to dense, brown-gray, silty fine sand. We interpreted both of these layers to be weathered recessional outwash. Below the weathered outwash, we encountered medium dense to dense gray fine to medium sand with silt and varying amounts of gravel, which we interpreted to be native recessional outwash. Test Pit 2 was terminated in the recessional outwash at a depth of 8.1 feet below the existing ground surface.

Hydrologic Conditions

Heavy groundwater seepage was encountered in Test Pits 1 and 2 at approximate depths of 5.2 to 6.7 feet below the existing ground surface, respectively. The groundwater seepage is interpreted to be part of the regional water table. We would expect the groundwater table to rise slightly during wetter times of the year. Moderate to heavy caving was also encountered between 5.2 feet and 6.7 feet and the extent of each test pit.

SENSITIVE AREA EVALUATION

Seismic Hazard

We reviewed the 2006 International Building Code (IBC) for seismic site classification for this project. Since medium dense to dense silty was 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 recessional outwash interpreted to underlie the site has a low potential for liquefaction or amplification of ground motion.

Erosion Hazard

The criteria used for determination of the erosion hazard for affected areas include soil type, slope gradient, vegetation cover, and groundwater conditions. The erosion sensitivity is related to vegetative cover and the specific surface soil types, which are related to the underlying geologic soil units. The Soil Survey of Snohomish County Area, Washington, by the Soil Conservation Service (SCS) was reviewed to determine the erosion hazard of the on-site soils. The surface soils for this site were mapped as Custer fine sandy loam, 0 to 2 percent slopes, and Lynnwood loamy sand, 0 to 3 percent slopes. The erosion hazard for these materials is listed as slight. It is our opinion that the erosion hazard for site soils should be low in areas where vegetation is not disturbed.

LABORATORY ANAYLYSIS

We performed three grain-size sieve analyses on soil samples from both test pits. The results of the sieve analyses are presented as Figures 5 through 7.

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 generally underlain by competent native recessional outwash soils. However, we did encounter small areas of modified ground, indicating that previous grading activities may have occurred on the site, possibly during the construction of the espresso stand. The modified ground and any loose material should be removed and re-compacted, or replaced with structural fill. The native soils should provide adequate support for foundation, slab, and pavement loads. We recommend that the building be designed utilizing shallow foundations. Footings should extend through the modified ground or loose soil, and be founded on the underlying medium dense or better native soil, or structural fill extending to these soils. The medium dense or better soil should typically be encountered approximately two feet below the existing surface, based on our explorations.

Excavations for the underground service bays will be approximately eight feet below the existing ground surface and retaining walls will be needed to support these cuts. Also, heavy groundwater and caving was encountered in the test pits. Dewatering of this area will likely be needed to facilitate the installation of the underground structures. Also, the retaining walls and slabs-on-grade should be designed to resist hydrostatic and buoyancy forces. Dewatering plans can be evaluated at the time of construction, based on prevailing groundwater conditions. It is our preliminary opinion that deep wells and/or well points will be needed on this site to effectively control groundwater.

Stormwater is planned to be directed to an on-site infiltration system. However, we encountered groundwater at a shallow depth. The stormwater manual requires a 5-foot separation between groundwater and the bottom of the infiltration trench. The manual allows a reduction in the separation if mounding analysis is conducted. The mounding analysis could be conducted during final design based on actual locations and elevations of the infiltration system. This is further discussed in the **Stormwater Infiltration** subsection of this report.

The upper soils encountered on this site are considered moisture-sensitive, and will disturb 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. The native on-site soils could be used as structural fill provided they could be compacted to specifications. 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.

Site Preparation and Grading

After erosion control and dewatering measures are implemented, site preparation should consist of removing any undocumented fill and loose soils from the building and other structural areas to expose medium dense or better native soils. Based on our explorations, we anticipate excavation depths of approximately one to three feet in the area of the planned building to reach competent subgrade. However, additional stripping may be required if areas of undocumented fill and/or loose soil are encountered in unexplored areas of the site.

After excavating the surficial material, 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.

The upper site soils are considered 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. The existing undocumented fill material may be partially suitable for use as structural fill. The underlying native 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 Slopes

We anticipate cuts on the order of 8 to 10 feet for the underground service bays and utility installation on this project. 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. These inclinations also assume that the groundwater table is effectively dewatered.

For planning purposes, we recommend that temporary cuts in the on-site soils be no steeper than 2 Horizontal to 1 Vertical (2H: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.

We encountered groundwater and moderate to heavy caving at approximately five to seven feet below the existing ground surface. These conditions need to be addressed for the planned underground service bay excavations. We can provide specific recommendations for dewatering/shoring of the excavations once plans are finalized.

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 one 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 2006 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 2,000 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 one-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.

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 structural 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). The on-site soils may be suitable for use as structural fill depending on the moisture, debris, and organic 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. For slabs cast underneath the prevailing groundwater table elevations, the slab should be designed to withstand hydrostatic and buoyancy forces. Also, the slab should be adequately sealed to prevent water leakage. 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 is optional and is intended to protect the vapor barrier membrane and to aid in curing the concrete.

Retaining Walls

Retaining walls will be needed on this site for the underground service bays. The site should be effectively dewatered prior to installing the walls. The walls should be designed to withstand full hydrostatic and buoyancy forces, and the walls subgrade should be covered with a layer of 1 foot of 2- to 4-inch crushed rock. The walls should be adequately water-proofed to prevent leakage into the underground service pits.

The lateral pressure acting on subsurface retaining walls is dependent on the nature and density of the soils 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 the pressure exerted by a fluid with a density of 35 pcf for yielding (active condition) walls, and 60 pcf for non-yielding (at-rest condition) walls. A full hydrostatic pressure of 62.4 pcf should be added to these values since we do not expect that the walls could be drained.

These recommended lateral earth pressures are for a 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, hydrostatic forces, or other surface loads. We could consult with you and your structural engineer regarding additional loads on retaining walls during final design, if needed.

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 eight-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.

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. Depending on the tolerance to pavement cracking, the undocumented fill should be removed and replaced with structural fill or, at a minimum, thoroughly compacted prior to placing the pavement section. 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 base course.

Stormwater Infiltration

We performed three grain-size sieve analyses on soil samples obtained from Test Pit 1 at depths of 1.6 and 3.1 feet, and in Test Pit 2 at a depth 1.7 feet below the existing ground surface, in order to establish design infiltration rates for on-site infiltration. The results of the grain-size analyses are presented as Figures 5 through 7. We referenced the 2005 Washington State DOE Stormwater Management Manual for Western Washington to determine the design infiltration rates.

The above-referenced manual requires a 5-foot separation between the bottom of the infiltration systems and high groundwater elevations. We encountered groundwater seepage at approximately 6.7 feet and 5.2 feet in Test Pits 1 and 2, respectively. The separation distance can be reduced to three feet provided that further analysis is conducted. Based on the grain-size analyses and the information found in the manual, the on-site material likely to be encountered in the planned infiltration area at Test Pit 1 and 3.1 feet and Test Pit 2 at 1.7 feet have design infiltration rates of 2.0 inches per hour, respectively. The sample taken at 1.6 feet in Test Pit 1 contains too much silt and is not suitable for infiltration. We should be retained to review the infiltration system design and final locations. Mounding analysis could be conducted at that time depending on actual conditions and final design. We recommend that the infiltration trenches be extended to the underlying clean sand. We should be retained to verify this condition in the field at the time of construction.

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 structures. 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 structures. Surface water should be collected by permanent catch basins and drain lines, and be discharged into an appropriate discharge system.

Subsurface Drainage: If groundwater is encountered in shallow excavations 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. The groundwater table is relatively shallow on this site. If excavations below the groundwater elevations reported in the explorations are planned, a dewatering system needs to be installed prior to attempting excavations. This can be evaluated during final design. The need and actual design for such systems should be determined in the field at the time of construction.

We recommend the use of footing drains around the structure. Footing drains should be installed at least one foot below planned finished floor elevation. The drains should consist of a minimum four-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, or drainage composite may also be used instead. 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.

It is unlikely that the below-grade structures could be effectively drained. We therefore recommend that these elements be designed to withstand hydrostatic and buoyancy forces based on a groundwater elevation at the ground surface. Extensive water-proofing will also be needed to prevent leakage into these areas.

USE OF THIS REPORT

NGA has prepared this report for Kevin McAllister and Mr. Tim Kaintz and their 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.

o-O-o

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.

Anna Jordan
Staff Geologist

Bala Dodoye-Alali
Project Geologist

3/21/08
KHALED M. SHAWISH
STATE OF WASHINGTON
35215
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 7/28/08

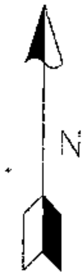
Khaled M. Shawish, PE
Principal

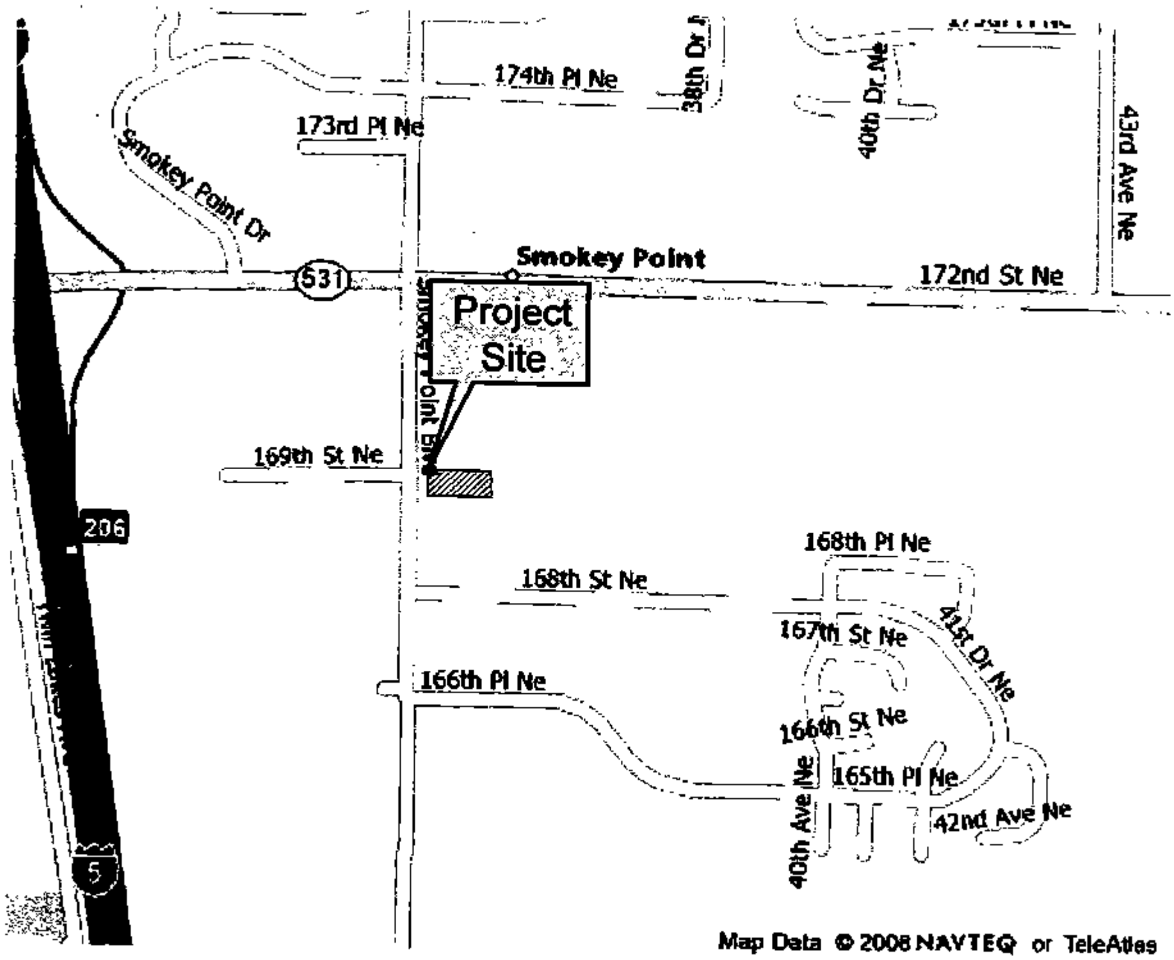
AJJ:BD:KMS:pkw

Seven Figures Attached

VICINITY MAP

Not to Scale

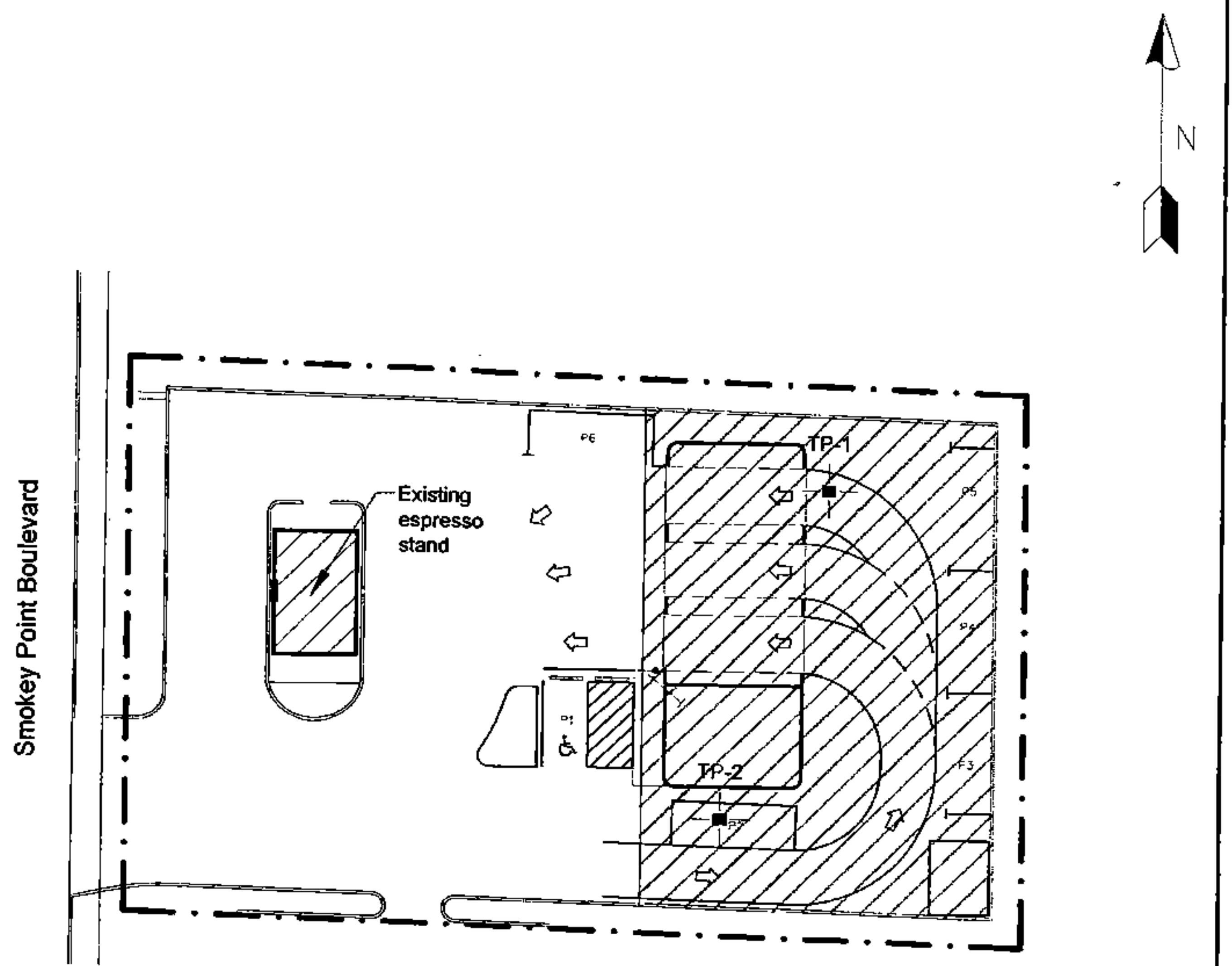




Marysville, WA

Project Number 783208	Xpress Lube/Espresso Vicinity Map	NGA Nelson Geotechnical Associates, Inc. Geotechnical Engineers & Geologists	No.	Date	Revision	By	CK
Figure 1			1	02/26/08	Original	SJW	AJJ

NGA Drafting 2008\783208 Xpress LubeVM.dwg



LEGEND

Property line

TP-1

Number and approximate location of test pit

Planned Development Area

0 30 60

Scale: 1 inch = 30 feet

Reference: Site Plan based on a site plan dated February 20, 2008, titled "Proposed Site Plan," prepared by Sound Design Engineering, Inc.

Project Number 783208	Xpress Lube/Espresso Site Plan	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	No.	Date	Revision	By	CK
Figure 2			1	2/27/08	Original	JRW	BD

NGA Drafting 2008\783208 XpressSP.dwg

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE - GRAINED SOILS	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
MORE THAN 50 % RETAINED ON NO. 200 SIEVE	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	SILT AND CLAY LIQUID LIMIT LESS THAN 50 %	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
MORE THAN 50 % PASSES NO. 200 SIEVE	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 783208	Xpress Lube/Espresso Soil Classification Chart	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	No.	Date	Revision	By	CK
Figure 3			1	2/27/08	Original	JRW	BD

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LOG OF EXPLORATION

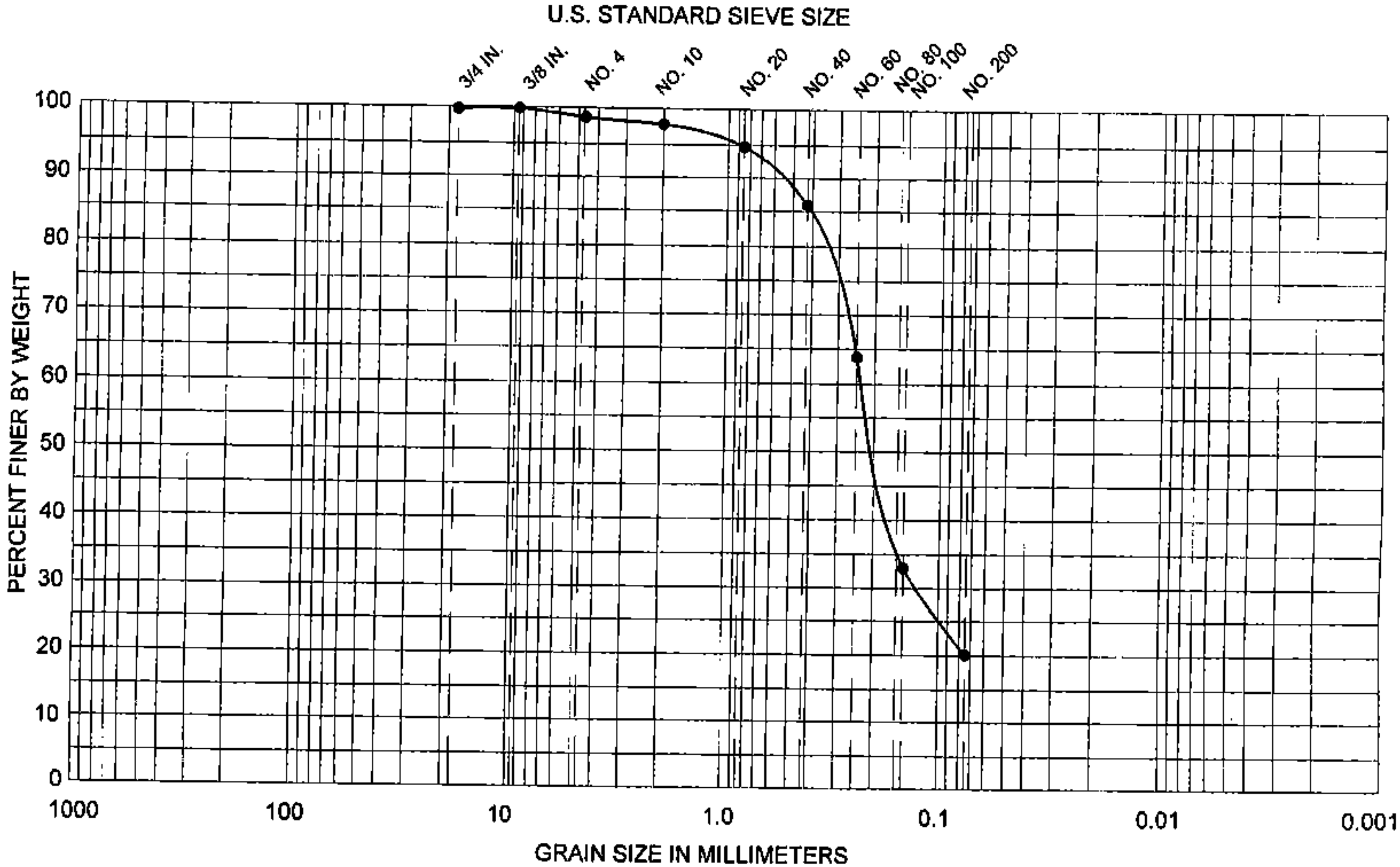
DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT ONE		
0.0 – 0.1		GRASS
0.1 – 0.5	SM	DARK BROWN, SILTY FINE SAND WITH ROOTS AND TRACE GRAVEL (LOOSE TO MEDIUM DENSE, MOIST)
0.5 – 1.7	SM	DARK BROWN SILTY FINE SAND (MEDIUM DENSE, MOIST)
1.7 – 3.6	SP-SM	BROWN-GRAY, FINE TO MEDIUM SAND WITH SILT (MEDIUM DENSE, MOIST)
3.6 – 9.0	SP-SM	GRAY, FINE TO MEDIUM SAND WITH SILT (MEDIUM DENSE, MOIST)

GROUND EL. = 119.15
− 6.7'
GROUNDWATER TABLE = 112.45
+ 3'
BOTTOM OF TRENCH MIN. 115.45

SAMPLES WERE COLLECTED AT 0.3, 1.6, 3.1 AND 9.0 FEET
HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 6.7 FEET
MINOR TEST PIT CAVING WAS ENCOUNTERED BETWEEN 6.7 AND 9.0 FEET
TEST PIT WAS COMPLETED AT 9.0 FEET ON 2/25/08

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT TWO		
0.0 – 0.7		GRAVEL (FILL)
0.7 – 1.2	SM	DARK BROWN, SILTY FINE SAND (MEDIUM DENSE, MOIST)
1.2 – 1.7	SM	DARK BROWN, SILTY FINE SAND (MEDIUM DENSE TO DENSE, MOIST)
1.7 – 3.2	SP-SM	BROWN-GRAY, FINE TO MEDIUM SAND WITH SILT (MEDIUM DENSE TO DENSE, MOIST)
3.2 – 8.1	SP-SM	GRAY, FINE TO MEDIUM SAND WITH SILT (MEDIUM DENSE TO DENSE, MOIST)

SAMPLES WERE COLLECTED AT 0.2, 1.0, 1.7, 2.5, 4.0, AND 8.1 FEET
HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 5.2 FEET
HEAVY TEST PIT CAVING WAS ENCOUNTERED BETWEEN 5.2 AND 8.1 FEET
TEST PIT WAS COMPLETED AT 6.0 FEET ON 2/25/08



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
●SM	TP-1	1.6 feet	Dark brown, silty fine to medium sand and trace gravel	Gravel = 1% Sand = 79% Silt/Clay = 20%

Project Number 783208	Xpress Lube/Espresso Sieve Analysis
Figure 5	

NELSON GEOTECHNICAL ASSOCIATES, INC.
GEOTECHNICAL ENGINEERS & GEOLOGISTS

No.	Date	Revision	By	CK
1	2/26/08	Original	SJW	AJJ

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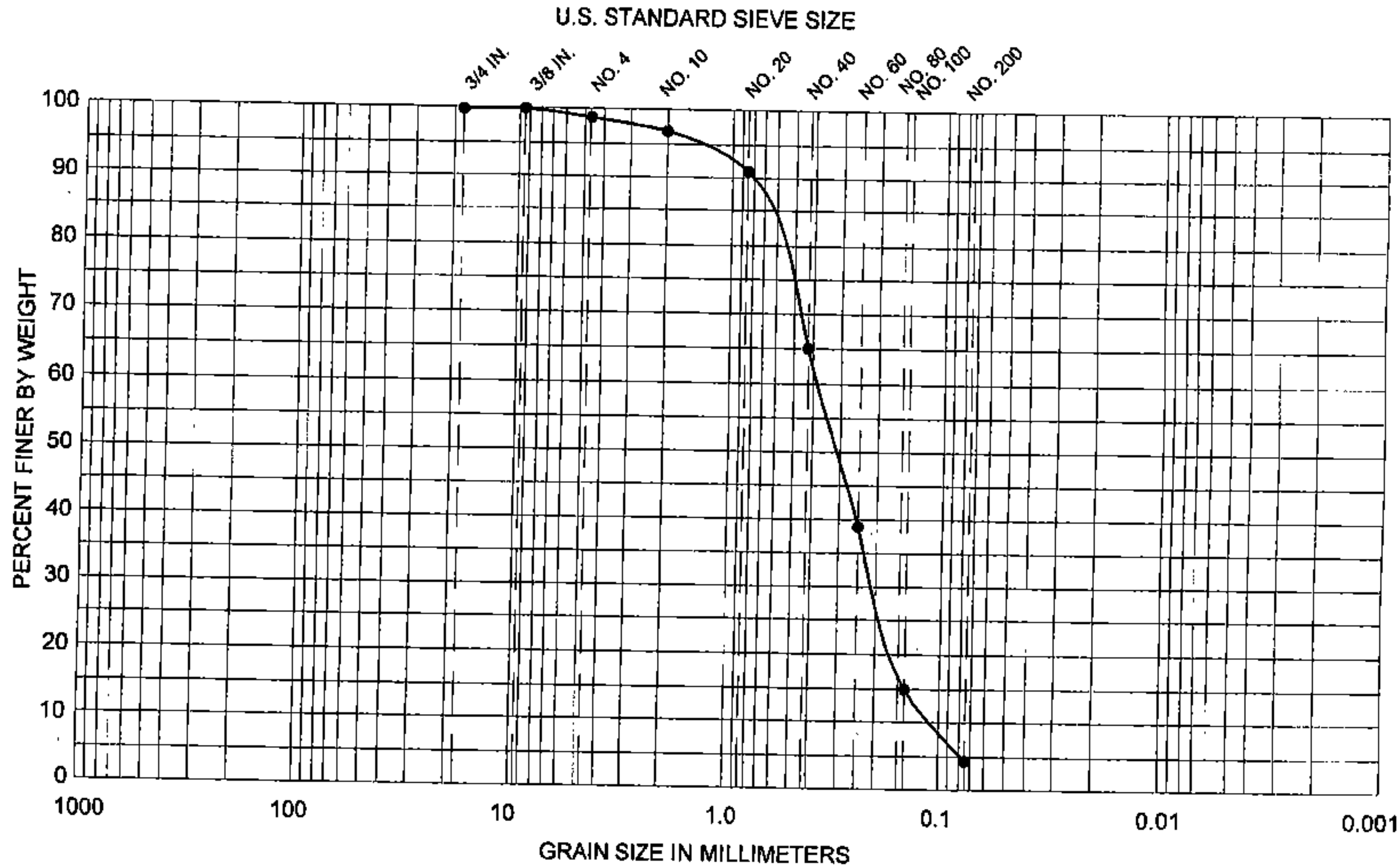
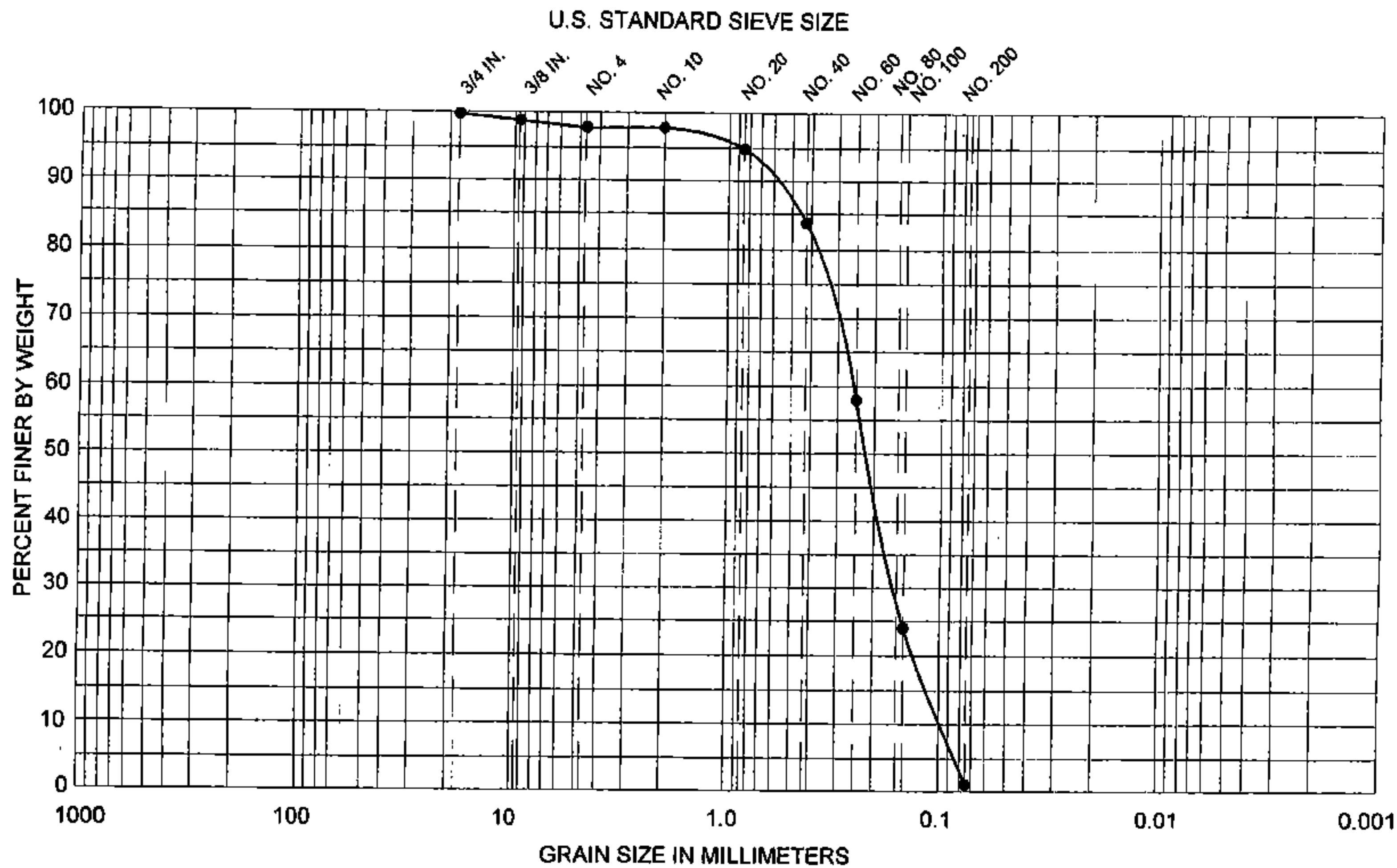


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
●SP	TP-1	3.1 feet	Brown-gray, fine to medium sand with trace silt and trace gravel	Gravel = 1% Sand = 95% Silt/Clay = 4%

Project Number	Xpress Lube/Espresso Sieve Analysis	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS
783208		
Figure 6		

No.	Date	Revision	By	CK
1	2/26/06	Original	SJW	AJJ



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
●SP	TP-2	1.8 feet	Dark brown, fine to medium sand with trace silt and gravel	Gravel = 1% Sand = 98% Silt/Clay = 1%

Project Number			No.	Date	Revision	By	CK
783208	Xpress Lube/Espresso Sieve Analysis	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	1	2/26/08	Original	SJW	AJJ
Figure 7							

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