Feasibility Study

North Owasso Boulevard Reconstruction

City of Shoreview, Minnesota

Municipal State Aid No. SAP 167-269-001
City Project No. 19-06
SHORE 140128 | January 4, 2019

SEH

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Feasibility Study

North Owasso Boulevard Reconstruction
City of Shoreview, Minnesota

Municipal State Aid No. SAP 167-269-001,
City Project No. 19-06
SEH No. SHORE 140128

January 4, 2019

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Susan M. Mason, PE

Date: January 4, 2019 License No.: 18612

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000

Executive Summary

Background and Findings

This report was authorized by the City of Shoreview Council at their meeting held on November 19, 2018. The proposed project includes reconstruction of approximately 2.5 miles of roadway including Arborgast Street from Victoria Street to West Owasso Boulevard and North Owasso Boulevard from West Owasso Boulevard to Soo Street. For the purpose of this study, the entire corridor will be referred to as North Owasso Boulevard. The portion of the project in the area of Owasso Park is in cooperation with Ramsey County Parks and Recreation Department (Ramsey County) and Ramsey-Washington Metro Watershed District (RWMWD).

This feasibility study reports on the existing conditions of the street, sanitary sewer, water main, storm sewer and street lighting in the project area. The recommendation of this report is to reconstruct the public roadway and trail, replace water mains and services and sanitary sewer mains and services. In addition, storm sewer collection and treatment systems and lighting will also be included. Consistent with State Aid rules, North Owasso Boulevard is to be reconstructed to a 32-foot face to face bituminous surfaced roadway with barrier style concrete curb and gutter, designed to carry 10 tons.

Project Costs

The costs associated with work in Owasso Park will be paid by Ramsey County, the costs associated with the surface water management BMP system located in the area of the park will be split by the City of Shoreview and Ramsey County. The remaining roadway and utility reconstruction associated costs will be the responsibility of the City of Shoreview and funded in part by Municipal State Aid funds, special assessments/bonding, and utility funds. The estimated total project costs are as follows:

City of Shoreview	
Street	$3,440,500
Water Main	$601,620
Sanitary Sewer	$366,890
Storm Sewer (non-BMP related)	$561,910
Joint Surface Water Management BMP	$1,226,440
Ramsey County Parks and Recreation Department Phase 2 Construction	
Parking Lot D and Boat Launch	$232,940
Total Estimated Project Cost	***$6,430,300***

Executive Summary (Continued)

Financing

Street	
Municipal State Aid	$ 3,350,900
Assessments	$ 89,600
Storm Sewer	
Municipal State Aid	$ 1,484,670
Ramsey County	$ 252,000
Assessments	$ 51,680
Water	
Water Fund	$ 594,420
Assessments	$ 7,200
Sanitary Sewer	
Sewer Fund	$ 362,290
Assessments	$ 4,600
Park Phase 2 – Parking Lot and Boat Launch	
Ramsey County	$ 232,940
Total	**$ 6,430,300**

Conclusions

1. The reconstruction project for North Owasso Boulevard is technically and financially feasible
2. The reconstruction of the roadway, replacement of water distribution system, replacement of sanitary sewer collection systems, installation of the storm collection and surface water management system, replacement of street lighting and the bituminous trail will directly benefit the residents of the neighborhood as well as other residents of Shoreview.

Recommendations

1. Proceed with improvements as proposed in this report.
2. Schedule the public hearing.

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Feasibility Study

North Owasso Boulevard Reconstruction

Prepared for City of Shoreview

1 Introduction

This report was authorized by the City of Shoreview Council at their meeting held on November 19, 2018. The proposed project includes reconstruction of approximately 2.5 miles of roadway including Arborgast Street from Victoria Street to West Owasso Boulevard and North Owasso Boulevard from West Owasso Boulevard to Soo Street. For the purpose of this study, the entire corridor will be referred to as North Owasso Boulevard.

The roadway serves residential neighborhoods, adjacent residential properties and Ramsey County's Lake Owasso Park. Please see Exhibit No. 1 for the map of the proposed project area. The roadway was originally a county road, but is now under City jurisdiction. Both the roadway and the underlying utilities are in need of improvements.

A portion of the project is adjacent to Ramsey County Parks and Recreation's Lake Owasso Park. Lake Owasso County Park is a 9-acre park originally built in the 1960s and has not seen any improvements for 50 years. The park is located between Lake Owasso and Lake Wabasso and is split by North Owasso Boulevard. The southerly park adjacent to Lake Owasso supports parking, boating and a swimming beach, and the north park adjacent to Lake Wabasso has picnic shelters, a playground and parking. The proposed project includes realignment of the existing road in the area of the park, shifting northerly to allow for more room to accommodate park facilities on the south side. The area of the park is also the proposed site of a large storm sewer treatment system, meant to provide water quality treatment that addresses the Ramsey-Washington Metro Watershed District (RWMWD) permitting rules for the new construction in the park and roadway, especially critical given the close proximity to Lakes Owasso and Lake Wabasso. The County started their phase one construction, primarily on the north side of the roadway last construction season. Phase two construction of their Parking Lot D and the boat launch is proposed to be part of the City project in order properly phase the construction work proposed. The proposed work in the area of the park is a joint project between the City of Shoreview, Ramsey County Parks and Recreation Department and RWMWD.

This feasibility study will report on the existing conditions of the street, sanitary sewer, water main, storm sewer and street lighting in the project area. In addition, the report will discuss the proposed project design for the street and utility elements, estimated project costs and the proposed financing including a preliminary assessment role.

2 Existing Conditions

2.1 Existing Street - Pavement Condition, Trail and Subsurface Soil Conditions

North Owasso Boulevard is a Municipal State Aid (MSA) collector roadway that carried 3,350 Average Daily Traffic (ADT) in 2015, but tends to carry a higher volume of peak hour traffic in the morning and evening rush hour. It has a bituminous surface approximately 32 ft. wide with bituminous curb and limited storm sewer. The surface water is conveyed to low points and discharged into the nearby lakes. An 8-ft. wide bituminous trail is adjacent to the roadway from Emmert Street (just short of Victoria Street) and continues to Soo Street and finally connecting to Rice Street. The speed limit is 30 mph.

The condition of the pavement indicates aging asphalt; there are both transverse and longitudinal cracks, failing bituminous curb and various patched areas. The trail was constructed in 1990 and is in generally good condition.

A subsurface soils exploration and laboratory testing program was undertaken by NTI and is included in Appendix C of this report. The soil profile generally consists of undocumented fill on top of glacial deposits, swamp and lacustrine deposits were also encountered. The fill soils range from 4-12 ft. deep and generally consist of poorly graded sand (SP), poorly graded sand with silt (SP-SM), well graded sand with silt (SW-SM), silty sand (SM), clayey sand (SC) and sandy lean clay (CL).

The native soils encountered were variable and consisted of poorly graded sand (SP), poorly graded sand with silt (SP-SM), poorly graded sand with clay (SP-SC), well graded sand with silt (SW-SM), clayey-silty sand (SC-SM), clayey sand (SC), silty sand (SM), silty lean clay (CL-ML) and sandy lean clay (CL).

The clayey and silty sands are slow to drain and are frost susceptible, making pavements constructed on them weaker and subject to freeze/thaw damage over time. Organic silt (OL), and peat (PT) were encountered in two locations in the area of the new alignment in the park and a small area near East Horseshoe Drive. The organic soils are considered unstable and therefore non-desirable as subsurface roadway materials. Please refer to the boring logs within Appendix C.

2.2 Existing Sanitary Sewer

Sanitary sewer currently exists in much of the right-of-way of Owasso Boulevard North. Eight-inch diameter vitrified clay pipe (VCP) that was originally constructed in 1961 serves most of the residential properties. There is a portion served by 12 inch diameter reinforced concrete pipe (RCP) on the south side from Chandler to East Horseshoe Drive constructed in 1968. There is force main in the corridor that serves the neighborhood of Owasso Street and discharges into the gravity system at Kent Street. The sanitary sewer system on the last 500 ft. near Soo Street has been structurally lined within the last 10 years. Most all of the residential properties have services that extend from the homes to the sanitary sewer main in the right-of-way.

2.3 Existing Water Main

The existing water main in the right-of-way of North Owasso Boulevard from Victoria Street to the park is 8-in. cast iron pipe (CIP) constructed in the early 1970s. The remaining water main is ductile iron pipe constructed in 1979. Most all of the residential properties have services that extend from the homes to the water main in the right-of-way.

2.4 Existing Storm Sewer

There is existing storm sewer on North Owasso Boulevard, but limited in coverage, condition and capacity. Surface water run-off from North Owasso Boulevard currently flows overland, along the street and ditches and into existing storm sewer systems or culverts where it is discharged into the lakes in the corridor. The low points and discharge locations are:

- east of Owasso Street, where it discharges into Lake Emily;
- east of Chandler Road, where it discharges into Lake Wabasso;
- west of East Horseshoe Drive (the vast majority of the drainage for this outlet is from outside the project area); and
- near the boat launch in the Park.

There is an existing pretreatment structure at the outlet to Lake Emily that was constructed just over 10 years ago in 2007. This storm sewer system also drains a large offsite catchment to the west of Victoria Street that is outside of the project limits.

The existing outlet/weir structure and culvert east of Chandler and west of West Horseshoe drive was constructed in 1990 for the Grass Lake Watershed to help regulate high water flows between Lake Owasso and Lake Wabasso.

The surface water from Soo Street to East Horseshoe Drive, including the run-off in the park area currently discharges either overland into Lake Owasso or through the large culvert that discharges near the boat launch.

2.5 Street Lights

North Owasso Boulevard is currently served by street lights owned by Xcel. The streetlights are cobra-head style luminaries mounted on wood poles with 75-watt high pressure sodium bulbs supplied by overhead power. They are located at all of the side street intersections with North Owasso Boulevard, leaving a couple gaps in the longer “blocks” in which there are no street lights.

3 Proposed Improvements

3.1 Streets

North Owasso Boulevard is proposed to be reconstructed with similar width and cross section. The majority of the roadway is proposed to be reconstructed with bituminous pavement and class five aggregate structural section with a granular sub base with concrete curb and gutter. The pavement will meet a ten-ton design, which is required by Municipal State Aid (MSA) due to the increased traffic, including the potential for heavier loaded trucks, exceeding the seven-ton standard required by the City. The width for the roadway is 32 ft. measured from face of curb to face of curb. The proposed typical section is illustrated on Exhibit 2.

North Owasso Boulevard is proposed to be reconstructed with similar alignment, with the exception of two locations.

The most significant realignment of the roadway is located in the area of Lake Owasso Park, where the roadway is proposed to curve northerly to allow for more room to accommodate park facilities on the south side. Underlying the roadway in the area of the park and also the southern parking lot of the park, is a large component of the proposed surface water treatment system that provides water quality treatment and storage to meet RWMWD permitting rules for the new construction in the park and roadway. Integral to the surface water treatment design, a 460-ft. long portion of the roadway section is proposed to be constructed utilizing PAVEDRAIN, a concrete paver, aggregate and geogrid structural system that allows surface water to drain directly into the underlying subgrade. Underneath the PAVEDRAIN structural section, larger aggregate designed specifically to allow water to move through the voids area creates storage for the surface water to be collected and treated through a filtration system prior to discharge into Lake Owasso. Please see the typical section proposed illustrated on Exhibit 3.

The existing alignment of North Owasso Boulevard is also proposed to be altered in the area of the curve at the top of the hill near Dale Street. The existing horizontal curve is very tight and creates sight distance issues for the driveways in the area and vehicles on the road. The proposed solution combines a wider horizontal curve with a slightly super elevated cross slope to obtain a curve that is safely driven at the posted speed. The “flatter” horizontal curve proposed, shifts the roadway alignment outside of the right-of-way and towards the property on the south side. City staff will work with the property owner to obtain any necessary easements prior to construction.

3.1.1 Subsurface Soil Corrections

The soil borings reveal organic deposits in a few places along the proposed roadway alignment in which additional fill will be placed with the potential to add stress to structurally weak soils. In the realignment area in the park, these underlying organic materials are proposed to be excavated and replaced with granular materials to provide a stable roadbed. In all other locations (except in the PAVEDRAIN section in the park), the roadway section includes an 18-in. deep sub cut, backfilled with select granular material to provide a frost-free, drainable sub-base that will promote a longer pavement life.

3.1.2 Trail

The trail is proposed to be located on the north side of the roadway, similar to the existing location. Even though the trail pavement is in relatively good condition, it is proposed to be reconstructed due to the disruption of the utility improvements and also in order to better match the profile and to provide a minimum boulevard width of eight ft. in most locations. The trail location between Owasso Street and Dale Street is proposed to be reconstructed directly behind the curb due to the steep terrain and limiting cross section in the area of the hill and nearby wetland. The width in this location will be paved 12 ft. wide to allow for a four-ft. paved shoulder and eight-ft. trail. The two new trail crossings in the park and all of the side streets crossings will be improved to include pedestrian ramps designed to Americans with Disability (ADA) standards.

3.2 Water Main

The project will include replacement of all the cast iron pipe (CIP) water main and replacement of most all of the water services from the main to the property line. CIP water main is located on the project from Victoria to just past the realignment in the area of the park where it changes to ductile iron pipe (DIP). It has been the City's practice to upgrade CIP water main when the other types of construction work would disturb the original pipe installation and could potentially fracture as cast iron is a relatively brittle material. The new pipe material is proposed to be made from polyvinyl chloride (PVC) for high pressure applications (type C-900) which is durable, hard to damage, long-lasting pipe material commonly used for public utility water main applications. As part of the project, all of the gate valves and hydrants will also be replaced. One-in. copper services and curb stops are proposed to be replaced in all locations, except the area of the ductile pipe main, east of the park.

There are three new water services proposed for the two empty lots east of 3366 North Owasso Boulevard, located across from Dale Street and also to serve 3366 North Owasso Street.

3.2.1 Sanitary Sewer

City staff reviewed the condition of the existing sanitary sewer in the project corridor and recommend replacement of much of the existing pipe. The recommendation is based on the number and type of repair needs and the age and type of the existing pipe. The older vitrified clay pipe (VCP) is proposed to be replaced from Dale Street to just beyond the area of the park. On the west end of the project, the sewer is in good condition and the pipe is reinforced concrete. The section of sewer east of the park has been structurally lined and will remain. The services were never lined, but City staff will address those with another future lining project.

The proposed sanitary sewer work for the project will include the replacement of all of the sanitary sewer services within the roadway right-of-way from Victoria to just east of the park. It has been the City's practice to replace the sanitary sewer services with PVC in reconstruction areas where VCP sewer services exist and are susceptible to cracking and root intrusion. PVC pipe is durable, has tight joints and is long-lasting.

Two additional sanitary sewer services are proposed to be added to the empty lots just east of 3366 North Owasso Boulevard and across from Dale Street.

3.3 Surface Water Management

3.3.1 Surface Water Management from Victoria Street to East Edge of Lake Owasso Park

The narrow right of way, vicinity to the lakes, and residential nature of the corridor between Victoria Street to Lake Owasso Park limited the opportunity for stormwater management along this segment. Thus, the proposed improvements for this portion of the project include installation of a stormwater collection and treatment system consisting of a series of catch basin sump manholes with a pretreatment device installed (SAFL baffles) at the low point catch basins, prior to discharge. This includes the use of the existing treatment manhole located at the discharge point at Lake Emily. One area of the project has sandy soils that will support infiltration is located between Kent Street and Chandler Road. An underground perforated storm sewer pipe that will store water and then infiltrate into the surrounding area is proposed Assuming the proposed

stormwater management BMP located at Lake Owasso Park (see Section 3.3.2) fully fulfills the Project's permanent stormwater management permitting requirements, the City may decide to either bank the applicable stormwater treatment credits from the perforated pipe or receive cost-sharing from RWMWD.

3.3.2 Ramsey County Park/City of Shoreview/RWMWD joint project from East Horseshoe Drive to Soo Street

The area of the project in Lake Owasso Park is part of a 13.8-acre sub-watershed district which currently discharges directly into Lake Owasso. This area has both unique technical constraints and a significant opportunity to approach stormwater management in an innovative way by combining the efforts and reconstruction plans of Ramsey County Parks and Recreation Department and the City of Shoreview. In addition, this segment of the project has brought RWMWD together with the County and City to develop the best possible project outcome to meet permit requirements and, more importantly, result in better protection for the nearby lakes.

According to the Stormwater Management Master Plan prepared by Barr Engineering dated June 19, 2017 (Revised July 19, 2017) for RWMWD, the proposed design includes a suite of stormwater management best management practices (BMPs) to meet the required volume and water quality permit requirements. Please see the report for more details regarding the permit rules and approach. The design specifically includes storm sewer, inline storm manhole pretreatment devices, pervious pavement (pavers for North Owasso Boulevard and porous pavement for the parking lot), filtration basins, underground aggregate stormwater storage and perforated piping. The project is a demonstration project intended to implement many of the design guidelines set forth in the Living Streets approach to street reconstructions within RWMWD. A brief description of the system is described below (from Barr's 2017 report).

After undergoing pretreatment by means of inline storm manhole pretreatment devices such as a "SAFL baffle", storm sewer will discharge into the large rain water garden. In addition, surface water that enters through pervious pavement will enter the underground storage space, where an underground water control structure will convey low flows for the stormwater treatment events to the stormwater management features. Water will be stored from elevation 891.5 ft. to 893.0 ft. in rainwater gardens and underground aggregate (void space) storage. The retained stormwater will then be filtered through the rainwater garden sand trench and then flow to the lakes in the underdrain system. Larger flows will overtop at elevation 893.0 ft. and be conveyed from the pretreatment cell to Lake Owasso. Similarly, large flows that exceed the design capacity of the storm sewer at the eastern boat ramp will flow down the boat ramp to Lake Owasso. In addition, the project will also strive to mitigate drainage issues along driveways on the north side of North Owasso Boulevard across from the boat ramp.

Plans and specifications will incorporate erosion control practices consistent with the Minnesota Pollution Control Agency's (MPCA) Best Management Practices, Minnesota State Aid guidelines, RWMWD requirements and meet all of the requirements of the National Pollution Discharge Elimination System (NPDES) permit.

3.4 Street Lighting

The proposed street lights for North Owasso Boulevard include new poles, overhead LED lighting units with underground electrical and cabinets owned and maintained by the City with power purchased from Xcel. The existing lights currently located at all of the intersections are proposed

to be replaced by new lights. Two new locations are also proposed to fill in a lighting gap between Emmert and Owasso Street and also East and West Horseshoe Drive. Lights are proposed to be placed at each pedestrian crossing in the park. The motion sensor light at the boat launch is proposed to be connected to the City's lighting system but maintained and paid for by the County.

3.5 Private Utilities

The City notifies all utility companies as it relates to the proposed improvements on projects. Private utility companies and their associated agencies are located on this project and include:

- Comcast Communication – Cable Television
- Century Link – Telephone and Communications
- Xcel Energy – Gas
- Xcel Energy – Electric

For the majority of the project, impacts to the private utilities will be minimal, requiring relocations of some overhead power poles that may be in conflict with the new trail.

In the area of the realignment in the park, every private utility will need to relocate. An initial meeting with the utility companies was held last January 2017 to give them all as much notice as possible and then another recently in December 2018. The gas company expects to replace their gas main in the entire project area from Victoria Street through the park area to Soo Street, moving it from the south side of the street to the north. Century Link needs about one year's time to relocate a 12-way concrete duct line and PVC duct bank. Comcast will also relocate on Xcel's pole when they move.

The City of Shoreview encourages these companies to repair or replace their utilities during or prior to the start of Shoreview's construction projects and will continue to coordinate the necessary work with this project.

3.6 Landscaping

It is anticipated that this project will have an impact on boulevard trees. As per past practices, the City will replace boulevard trees on the project where opportunities arise. The City code references that trees are to be replaced on a two-for-one basis. Where boulevard trees are close to construction limits, the City will make every effort to protect existing trees within the right-of-way, however, when necessary, trees will be removed to allow for the proposed construction, in particular, service replacement and/or for clear zones. As per past practice, staff will work with adjacent property owners individually to assess impacts on trees located on private property.

3.7 Permits

The City is required to obtain necessary permits to construct this project. Permits are necessary for the reconstruction as it relates to site disturbance, public utility construction and work located in the right-of-way.

As required by the MPCA, a NPDES permit is needed for disturbances over one acre in size. Local agencies and contractors must obtain permits and provide surety to prevent erosion from existing the construction site. This permit is a requirement of the City specification and obtained as a common permit between the City and the Contractor.

The project will disturb greater than one acre and more than 10,000 sq. ft. adjacent to a water body, which triggers the need for stormwater management per the RWMWD District Rules. In addition, the District's rate control rules need to be addressed.

- Run-off rates shall not exceed existing run-off rates for the 2-, 10- and 100-year critical storm events using Atlas-14 rainfall magnitudes and distributions for this project.
- RWMWD Volume Reduction, & Water Quality rules must be met.
- Stormwater run-off volume reduction shall be achieved onsite in the amount of 1.1 inches of run-off from the new and newly reconstructed impervious surfaces, or an adjusted volume treated through alternate means, such as filtration, as described in RWMWD's Alternative Compliance Sequencing.
- Alternatively, the stormwater management permit can be fulfilled if the Project's stormwater BMP improvements meet or exceed a cost cap set for linear projects set by RWMWD.
- The proposed Sediment and Erosion Control measures must meet the requirements of the RWMWD.

The City will also be required to obtain approval from the Department of Health for the work associated water distribution system prior to construction starting.

4 Estimated Costs

A detailed cost estimate is included in Appendix A of this report. The cost estimate is based on construction prices experienced for similar improvements. The Total Project Cost includes an additional 25% to cover non-construction costs associated with the project such as engineering, legal, administrative costs and another 10% for construction contingencies. Some of the costs included in the project are for the County's phase two park construction work and have been split out accordingly. The cost associated for the special surface water management treatment system in the area of the park has also been split out separately and will be paid for based on an agreement developed between Ramsey County Parks and Recreation Department and the City of Shoreview.

City of Shoreview	
Street	$3,440,500
Water Main	$601,620
Sanitary Sewer	$366,890
Storm Sewer (non-BMP related)	$561,910
Joint Surface Water Management BMP	$1,226,440
Ramsey County Parks and Recreation Department Phase 2 Construction	
Parking Lot D and Boat Launch	$232,940
Total Estimated Project Cost	***$6,430,300***

5 Estimated Assessments

Assessments proposed for improvements are administered in accordance with Minnesota Statutes, Chapter 429 and the City of Shoreview Street Renewal Program Unit Assessment Policy dated March 7, 1986.

Appendix B has a detailed map and list of residential properties with proposed assessments for the improvements. The payback period for assessments related to street and storm sewer is typically 10 years and 15 years for assessments for properties receiving new service connections.

5.1 Street

Shoreview's Street Assessment Policy states that adjacent property and any property with primary access to the roadway receiving the improvement will be assessed the equivalent cost of concrete curb and gutter on an "equivalent unit" basis. A typical single-family residential lot is considered as one "unit" for street assessment purposes.

Total number of cost of concrete curb and gutter	$ 89,600.00
Total number of units	56.0
Estimated street assessment amount	$ 1,600/unit

5.2 Storm Sewer

Storm sewer assessments are proposed for this project. In accordance with the City's assessment policy for storm sewer the amount assessed for each lot is dependent on the size of the lot. The first 13,000 sq. ft. is assessed at $0.07/sq. ft., additional area from 13,001 to 19,000 sq. ft. is assessed at $0.035/sq. ft., with no additional assessment over 19,000 sq. ft.. The maximum storm sewer assessment for a residential lot on this project is $1,120/unit.

Total assessed cost of storm sewer	$ 51,684.01
Estimated stormwater assessment amount	Dependent on lot size

5.3 Water

New water services will be extended to three lots adjacent to North Owasso Boulevard that currently do not have water services, the benefitting lots will be assessed the cost to install the service.

Total assessed cost for water	$ 7,200.00
Total number of units	3
Estimated water assessment amount	$ 2,400/unit

In addition to the assessment a trunk water facility charge equal to $7.75 multiplied by the front foot of the lot at the street will be charged to each of the 3 lots for new connections to the water system.

5.4 Sanitary Sewer

New sanitary sewer services will be extended to two lots located adjacent to North Owasso Boulevard that currently do not have sanitary services, the benefitting lots will be assessed the cost to install the services.

Total assessed for sanitary sewer	$ 4,600.00
Total number of units	2
Estimated sanitary sewer assessment amount	$ 2,300/unit

6 Funding Sources

The proposed improvements for North Owasso Boulevard are proposed to be funded by a combination of Municipal State Aid funds, special assessments and bonding, utility funds and funds from Ramsey County Parks and Recreation Department.

Street	
Municipal State Aid	$ 3,350,900
Assessments	$ 89,600
Storm Sewer	
Municipal State Aid	$ 1,484,670
Ramsey County	$ 252,000
Assessments	$ 51,680
Water	
Water Fund	$ 594,420
Assessments	$ 7,200
Sanitary Sewer	
Sewer Fund	$ 362,290
Assessments	$ 4,600
Park Phase 2 – Parking Lot and Boat Launch	
Ramsey County	$ 232,940
Total	**$ 6,430,300**

7 Project Schedule

Currently the project team is working with the private utility companies to understand their construction schedule needs, since most all need to be relocated in roadway alignment change in the Park. The construction schedule may shift to accommodate their schedule. Assuming receipt and approvals of this report by the City Council, and construction beginning in August of 2019, the project schedule is proposed as follows:

- Council Receives Feasibility Report ..... January 7, 2019
- Public Improvement Hearing.....February 2019
- Council Approve Plans and Specifications .....June 2019
- Bid Opening .....July 2019
- Council Awards Contract.....July 2019
- Construction Starts.....August 2019
- Construction Complete.....November 2020
- Assessment Hearing .....September 2022

8 Conclusions and Recommendations

8.1 Conclusions

1. The reconstruction project for North Owasso Boulevard is technically and financially feasible
2. The reconstruction of the roadway, replacement of water distribution system, replacement of sanitary sewer collection systems, installation of the storm collection and surface water management system, replacement of street lighting and the bituminous trail will directly benefit the residents of the neighborhood as well as other residents of Shoreview.

8.2 Recommendations

1. Proceed with improvements as proposed in this report.
2. Schedule the public hearing.

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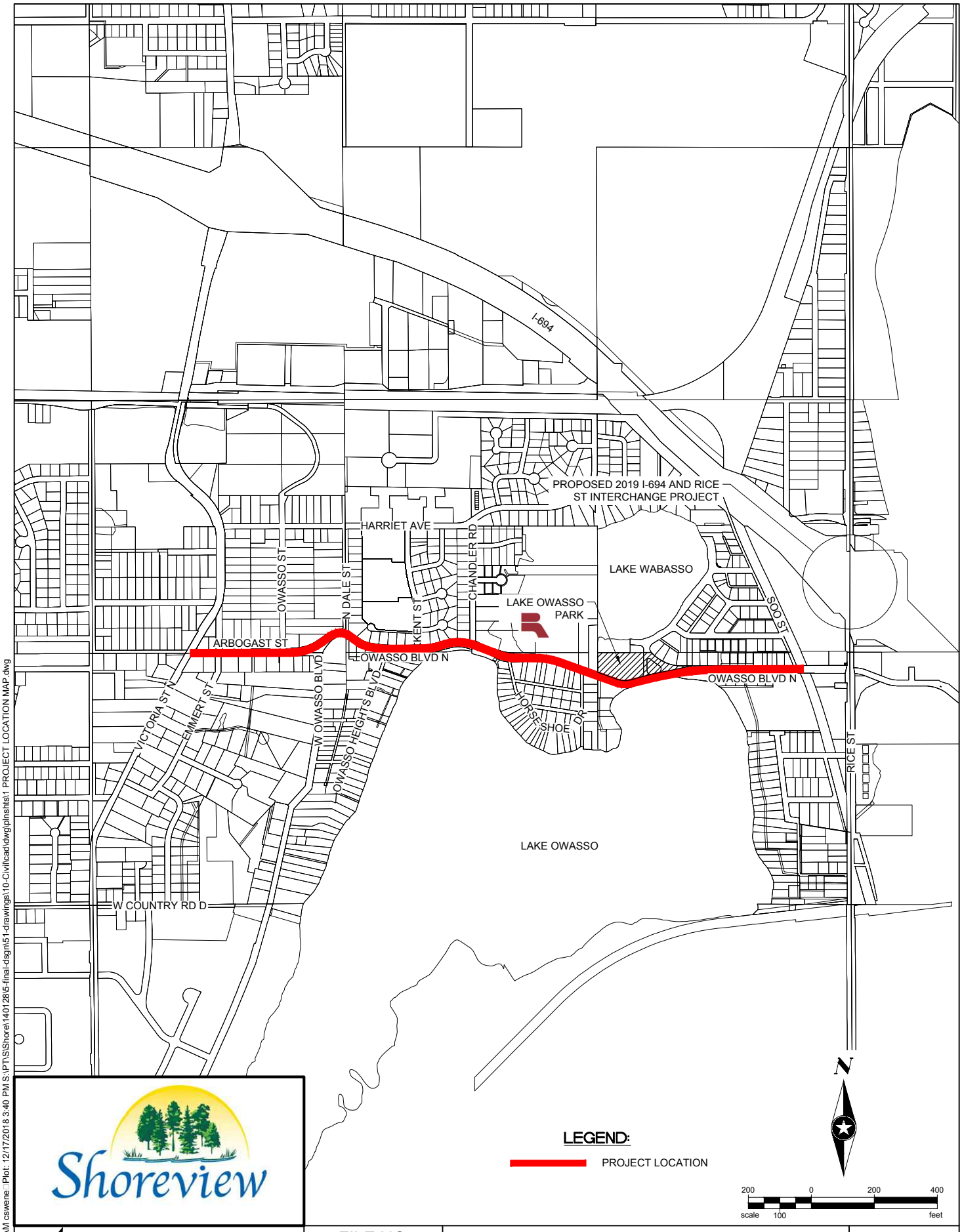
List of Exhibits

Exhibit 1 – Project Location Map
Exhibit 2 – Typical Sections
Exhibits 3A-E – Proposed Project Layout



Shoreview

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FILE NO.
SHORE 140128

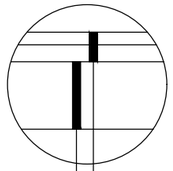
DATE:
12/17/18

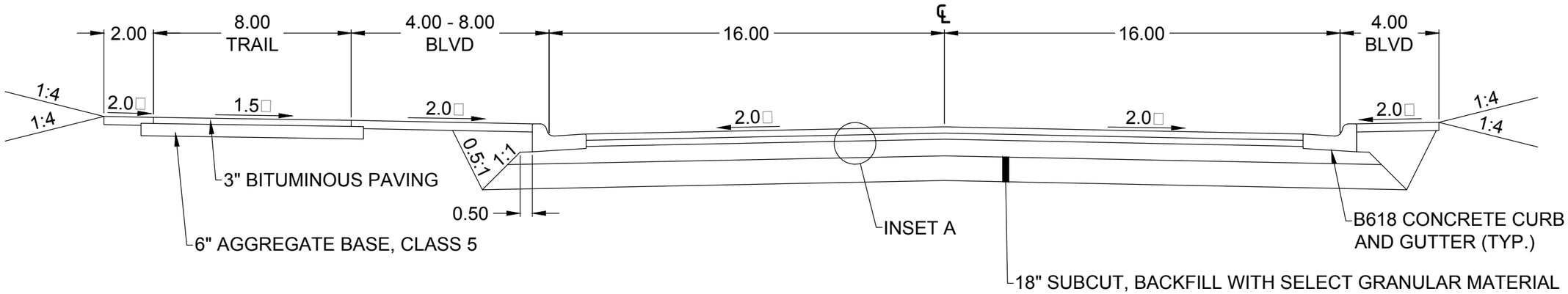
PROJECT LOCATION MAP
N OWASSO BLVD RECONSTRUCTION
SHOREVIEW, MINNESOTA

EXHIBIT NO. 1

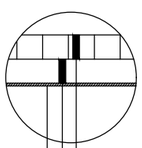
Save: 12/17/2018 9:39 AM cswene Plot: 12/17/2018 3:40 PM S:\PT\S\Shore\140128\5-final-dsgn\51-drawings\10-Civil\cad\dwg\plnsht\1 PROJECT LOCATION MAP.dwg

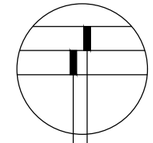
TYPICAL SECTION
(VICTORIA STREET TO WEST PARK ENTRANCE)
(EAST PARK ENTRANCE TO SOO STREET

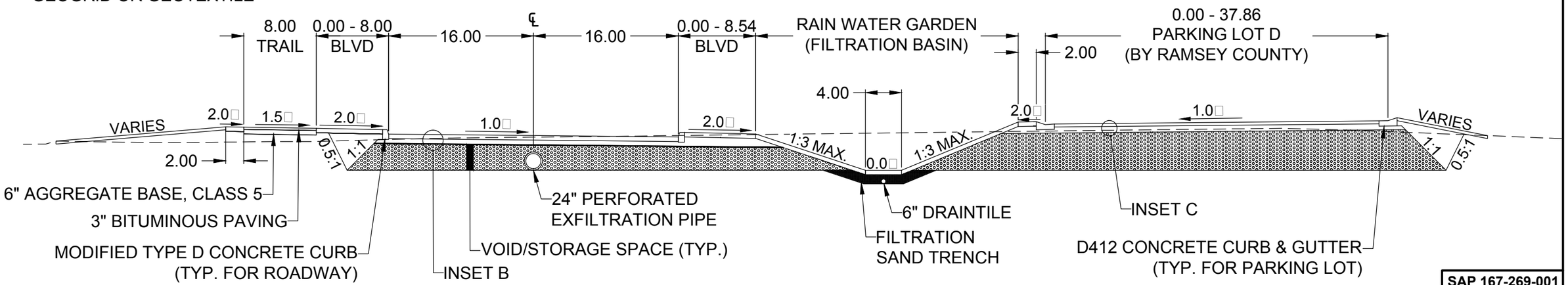




TYPICAL SECTION
(EAST PARK ENTRANCE TO WEST PARK ENTRANCE)







SEH PHONE: 651.490.2000 3535 VADNAIS CENTER DRIVE ST. PAUL, MN 55110-5196 www.sehinc.com	Shoreview	SHOREVIEW, MINNESOTA	TYPICAL SECTIONS N OWASSO BLVD RECONSTRUCTION	SAP 167-269-001 FILE NO. SHORE 140128 DATE 12/12/18	EXHIBIT NO. 2

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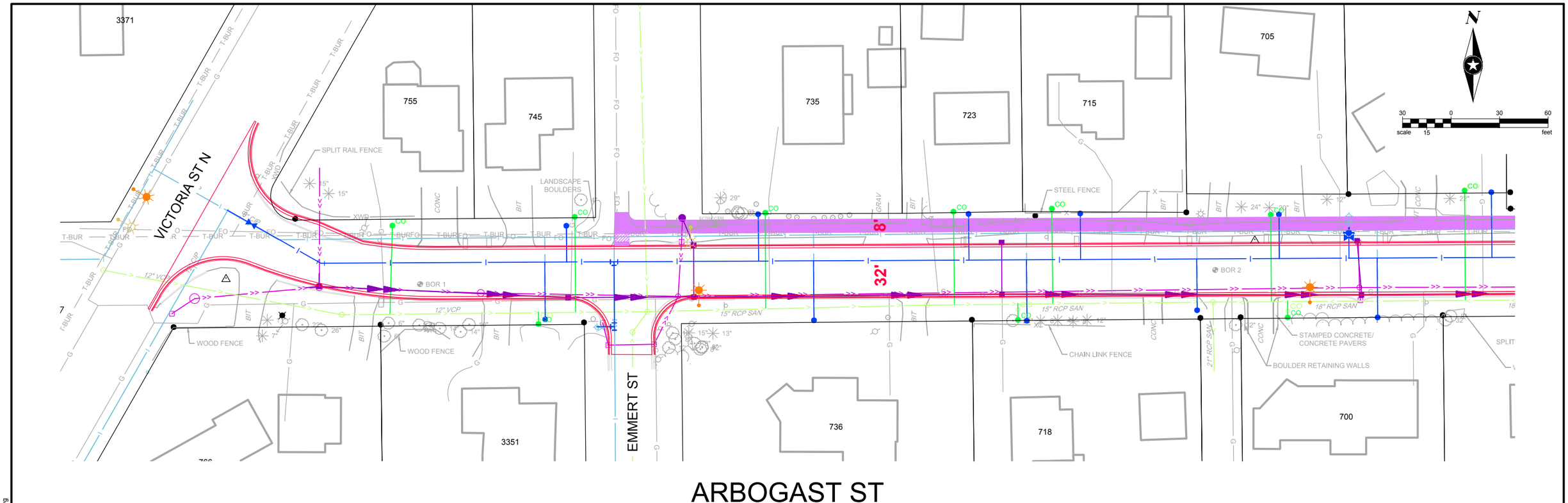

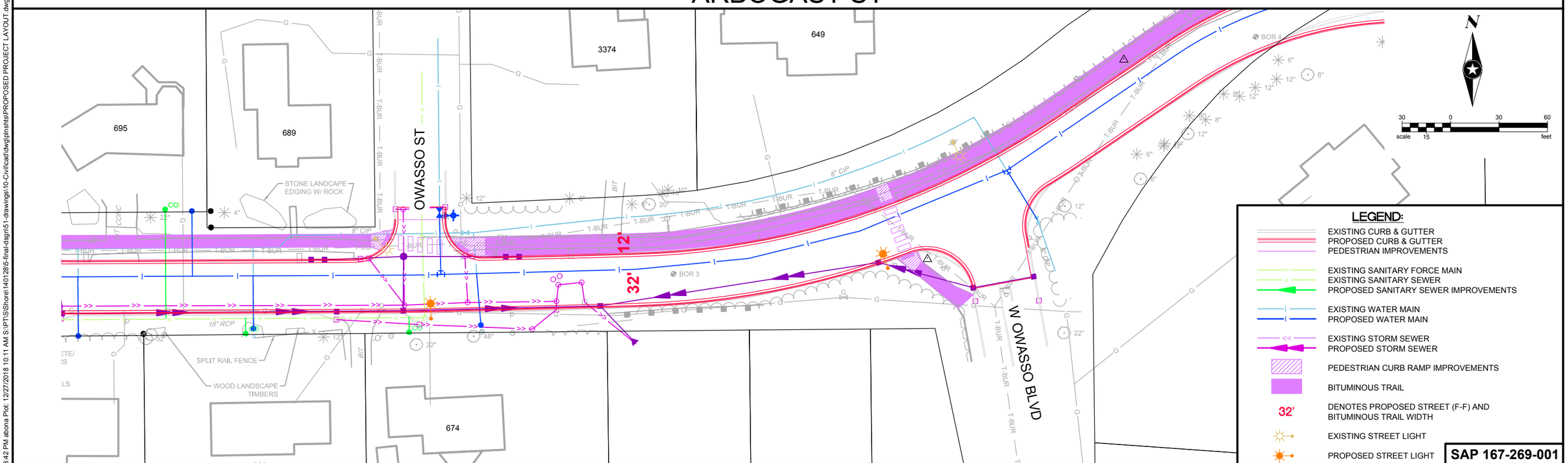

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SHOREVIEW, MINNESOTA

PROPOSED PROJECT LAYOUT

OWASSO BLVD N RECONSTRUCT

FILE NO. SHORE 140128

DATE 12/12/18

EXHIBIT NO. 3A

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SHOREVIEW, MINNESOTA

PROPOSED PROJECT LAYOUT

OWASSO BLVD N RECONSTRUCT

FILE NO. SHORE 140128

DATE 12/12/18

EXHIBIT NO. 3B

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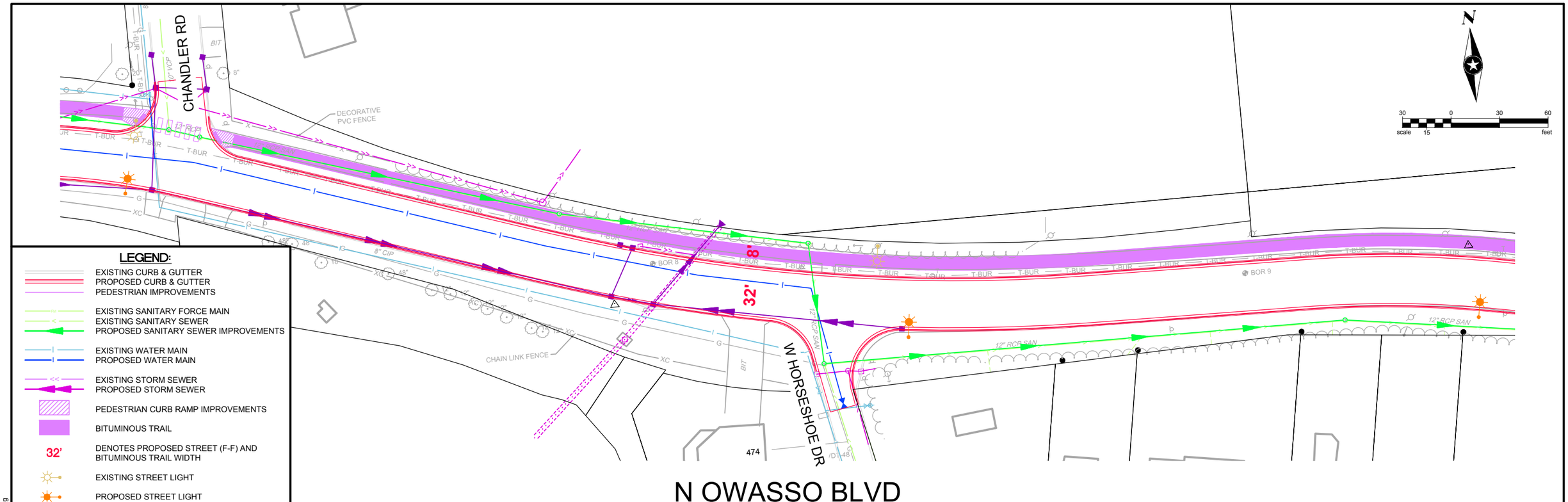
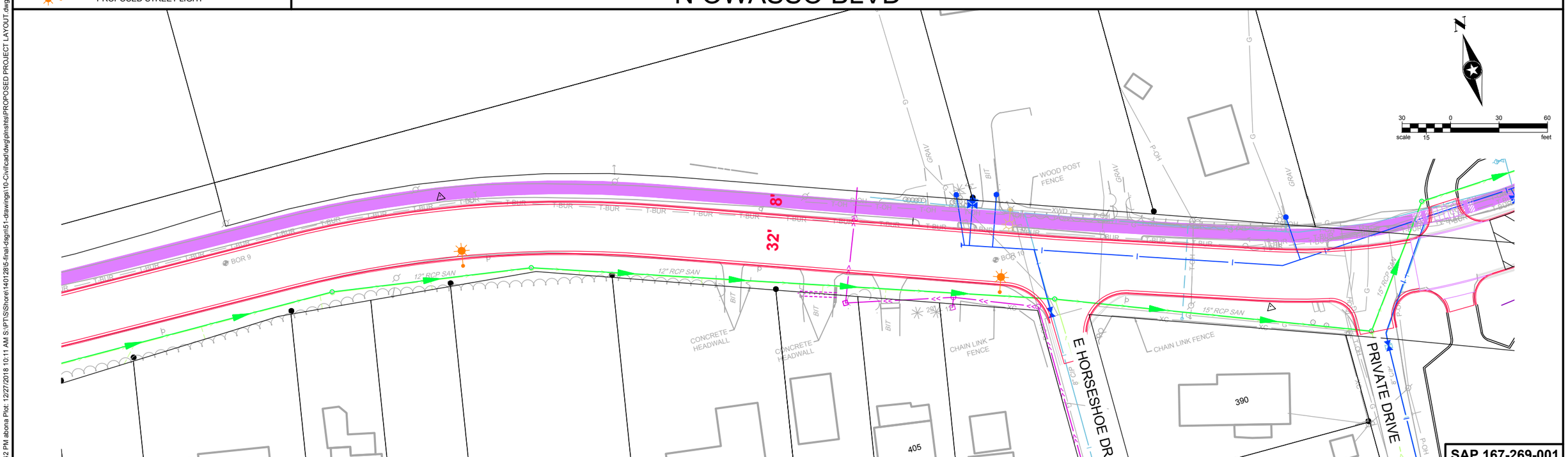


LEGEND:

- EXISTING CURB & GUTTER
- PROPOSED CURB & GUTTER
- PEDESTRIAN IMPROVEMENTS
- EXISTING SANITARY FORCE MAIN
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER IMPROVEMENTS
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PEDESTRIAN CURB RAMP IMPROVEMENTS
- BITUMINOUS TRAIL
- 32' DENOTES PROPOSED STREET (F-F) AND BITUMINOUS TRAIL WIDTH
- EXISTING STREET LIGHT
- PROPOSED STREET LIGHT

N OWASSO BLVD



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SHOREVIEW, MINNESOTA

PROPOSED PROJECT LAYOUT

OWASSO BLVD N RECONSTRUCT

FILE NO. SHORE 140128

DATE 12/12/18

EXHIBIT NO. 3C

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RAMSEY COUNTY PARK AND REC. DEPT.
PHASE 1 CONSTRUCTION

EXTENTS OF SPECIAL SURFACE WATER
MANAGEMENT TREATMENT AREA

8'

32'

RAMSEY COUNTY PARK AND REC. DEPT.
PHASE 2 CONSTRUCTION

PARKING LOT D

N OWASSO BLVD

LEGEND:

- EXISTING CURB & GUTTER
- PROPOSED CURB & GUTTER
- PEDESTRIAN IMPROVEMENTS
- EXISTING SANITARY FORCE MAIN
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER IMPROVEMENTS
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PEDESTRIAN CURB RAMP IMPROVEMENTS
- BITUMINOUS TRAIL
- 32' DENOTES PROPOSED STREET (F-F) AND BITUMINOUS TRAIL WIDTH
- EXISTING STREET LIGHT
- PROPOSED STREET LIGHT

N

scale 30 15 0 30 60 feet

BRICK LANDCAPE EDGING

265

255

245

8'

32'

9'

RAMSEY COUNTY PARK & REC. DEPT.
PHASE 2 CONSTRUCTION

WOODEN ARCH WOOD FENCE

LANDSCAPE ROCK & BOULDERS

BLACK STEEL FENCE

266

256

246

234

LAKE OWASSO

BOAT LAUNCH

N

scale 30 15 0 30 60 feet

SAP 167-269-001

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PROPOSED PROJECT LAYOUT

OWASSO BLVD N RECONSTRUCT

FILE NO. SHORE 140128

DATE 12/12/18

EXHIBIT NO. 3D

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OWASSO BLVD N

SAP 167-269-001

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SHOREVIEW, MINNESOTA

PROPOSED PROJECT LAYOUT

OWASSO BLVD N RECONSTRUCT

FILE NO. SHORE 140128

DATE 12/12/18

EXHIBIT NO. 3E

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Appendix A

Cost Estimate

N OWASSO/ARBOGAST PRELIMINARY ENGINEER'S ESTIMATE

					TOTAL		COUNTY PARK TO SOO ST		ARBOGAST/ N OWASSO TO PARK		COUNTY PARTICIPATING		BMP	
LINE	ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST
SECTION A: STREET														
1	2021.501	MOBILIZATION	LS	$222,000.00	**1**	**$224,220.00**	0.26	$57,720.00	0.54	$119,880.00	0.04	$8,880.00	0.17	$37,740.00
2	2101.505	CLEARING	ACRE	$5,000.00	**0.20**	**$1,000.00**			0.20	$1,000.00				
3	2101.505	GRUBBING	ACRE	$5,000.00	**0.20**	**$1,000.00**			0.20	$1,000.00				
4	2101.524	CLEARING	TREE	$250.00	**49**	**$12,250.00**	7	$1,750.00	42	$10,500.00				
5	2101.524	GRUBBING	TREE	$200.00	**49**	**$9,800.00**	7	$1,400.00	42	$8,400.00				
6	2104.502	SALVAGE MAILBOX SUPPORT	EACH	$50.00	**36**	**$1,800.00**	14	$700.00	22	$1,100.00				
7	2104.502	REMOVE SIGN TYPE C	EACH	$25.00	**70**	**$1,750.00**	31	$775.00	39	$975.00				
8	2104.502	SALVAGE SIGN	EACH	$30.00	**23**	**$690.00**	2	$60.00	14	$420.00	7	$210.00		
9	2104.502	SALVAGE SIGN (STREET NAME SIGN)	EACH	$65.00	**10**	**$650.00**	1	$65.00	9	$585.00				
10	2104.503	SAWING CONCRETE PAVEMENT (FULL DEPTH)	LF	$4.75	**139**	**$660.25**	58	$275.50	81	$384.75				
11	2104.503	SAWING BIT PAVEMENT (FULL DEPTH)	LF	$3.50	**1,323**	**$4,630.50**	420	$1,470.00	863	$3,020.50	40	$140.00		
12	2104.503	REMOVE CONCRETE CURB & GUTTER	LF	$3.00	**446**	**$1,338.00**			446	$1,338.00				
13	2104.503	REMOVE GUARDRAIL	LF	$25.00	**290**	**$7,250.00**			290	$7,250.00				
14	2104.503	SALVAGE FENCE	LF	$25.00	**840**	**$21,000.00**			840	$21,000.00				
15	2104.503	SALVAGE RETAINING WALL	LF	$25.00	**210**	**$5,250.00**	210	$5,250.00						
16	2104.504	REMOVE CONCRETE DRIVEWAY PAVEMENT	SY	$7.50	**115**	**$862.50**			115	$862.50				
17	2104.504	REMOVE BITUMINOUS PAVEMENT	SY	$4.00	**31,063**	**$124,252.00**	9104	$36,416.00	18861	$75,444.00	3098	$12,392.00		
18	2104.504	REMOVE BITUMINOUS DRIVEWAY PAVEMENT (INCL. TRAIL)	SY	$4.50	**8,052**	**$36,234.00**	2931	$13,189.50	5121	$23,044.50				
19	2104.518	REMOVE CONCRETE WALK	SF	$2.00	**58**	**$116.00**	8	$16.00	50	$100.00				
20	2105.504	GEOTEXTILE FABRIC TYPE ?	SY	$5.00	**4,788**	**$23,940.00**	4788	$23,940.00						
21	2105.507	COMMON EXCAVATION (EV)	CY	$11.25	**21,001**	**$236,261.25**	3891	$43,773.75	16480	$185,400.00	630	$7,087.50		
22	2105.507	MUCK EXCAVATION (EV)	CY	$10.00	**9,986**	**$99,860.00**	9986	$99,860.00						
23	2105.507	EXCAVATION SPECIAL 1 (891.0 FOR BALLAST ROCK & RAINGARDEN)	CY	$11.25	**8,015**	**$90,168.75**							8015	$90,168.75
24	2105.601	DEWATERING	LS	$25,000.00	**1**	**$25,000.00**	1	$25,000.00						
25	2105.609	SELECT GRANULAR BORROW (5% MOD)	CY	$15.00	**24,509**	**$367,635.00**	13771	$206,565.00	10312	$154,680.00	426	$6,390.00		
26	2105.609	RAIN GARDEN GRANULAR	CY	$40.00	**588**	**$23,520.00**							588	$23,520.00
27	2211.509	AGGREGATE BASE, CLASS 5	CY	$25.00	**6,375**	**$159,375.00**	1481	$37,025.00	4671	$116,775.00	223	$5,575.00		
28	2211.509	AGGREGATE BASE, CLASS 5 (FOR TRAILS)	CY	$30.00	**809**	**$24,270.00**	216	$6,480.00	508	$15,240.00	85	$2,550.00		
29	2301.603	CONCRETE HEADER	LF	$20.00	**64**	**$1,280.00**	64	$1,280.00						
30	SPEC	PERMEABLE PAVEMENT BEDDING COURSE(COUNTY PARKING LOT)	CY	$16.50	**126**	**$2,079.00**					126	$2,079.00		
31	SPEC	#57 STONE (CHOKER COURSE)	CY	$20.00	**648**	**$12,960.00**	399	$7,980.00			249	$4,980.00		
32	SPEC	OPEN GRADED STONE (BALLAST ROCK)	CY	$40.00	**7,303**	**$292,120.00**							7303	$292,120.00
33	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	$3.50	**1,594**	**$5,579.00**	368	$1,288.00	1157	$4,049.50	69	$241.50		
34	2360.509	TYPE SP 9.5 WEARING COURSE MIX (2,B)(BOAT LANDING)	TON	$68.00	**215**	**$14,620.00**					215	$14,620.00		
35	2360.509	TYPE SP 9.5 WEARING COURSE MIX (3,C)	TON	$68.00	**6,063**	**$412,284.00**	1462	$99,416.00	4601	$312,868.00				
36	SPEC	PERMEABLE BIT. MIXTURE FOR PARKING LOT(COUNTY LOT)	TON	$120.00	**345**	**$41,400.00**					345	$41,400.00		
37	2360.509	TYPE 9.5 BIT MIXTURE FOR DRIVEWAYS AND TRAILS (2,C)	TON	$100.00	**796**	**$79,600.00**	200	$20,000.00	504	$50,400.00	92	$9,200.00		
38	2451.609	PIPE BEDDING MATERIAL	TON	$12.00										
39	2521.518	4" CONCRETE WALK	SF	$7.00	**3,695**	**$25,865.00**			45	$315.00	3650	$25,550.00		
40	2521.518	6" CONCRETE WALK	SF	$9.00	**2,389**	**$21,501.00**	843	$7,587.00	1382	$12,438.00	164	$1,476.00		
41	2531.503	CONCRETE CURB AND GUTTER DESIGN B618	LF	$12.00	**12,179**	**$146,148.00**	3175	$38,100.00	9004	$108,048.00				
42	2531.503	CONCRETE CURB AND GUTTER DESIGN D412	LF	$20.00	**1,461**	**$29,220.00**					1461	$29,220.00		
43	2531.503	CONCRETE CURB DESIGN B6	LF	$15.00	**1,265**	**$18,975.00**	1265	$18,975.00						
44	2531.504	6" CONCRETE DRIVEWAY PAVEMENT	SY	$60.00	**173**	**$10,380.00**	58	$3,480.00	115	$6,900.00				
45	2531.504	8" CONCRETE DRIVEWAY PAVEMENT	SY	$70.00	**121**	**$8,470.00**	121	$8,470.00						
46	2531.618	TRUNCATED DOMES	SF	$44.00	**382**	**$16,808.00**	160	$7,040.00	182	$8,008.00	40	$1,760.00		
47	2540.602	INSTALL MAILBOX SUPPORT	EACH	$135.00	**36**	**$4,860.00**	14	$1,890.00	22	$2,970.00				
48	2540.603	INSTALL RETAINING WALL	LF	$25.00	**220**	**$5,500.00**	220	$5,500.00						
49	2540.618	PERMEABLE PAVER (PAVE DRAIN)	SF	$10.00	**18,644**	**$186,440.00**	18644	$186,440.00						
50	2545.502	LIGHTING UNIT SPECIAL	EACH	$3,600.00	**18**	**$64,800.00**	9	$32,400.00	9	$32,400.00				
51	2545.502	LIGHTING UNIT SPECIAL 1	EACH	$3,500.00	**1**	**$3,500.00**			1	$3,500.00				
52	2545.502	LIGHT FOUNDATION DESIGN E MODIFIED	EACH	$950.00	**1**	**$950.00**			1	$950.00				
53	2545.502	SERVICE CABINET	EACH	$2,000.00	**2**	**$4,000.00**	1	$2,000.00	1	$2,000.00				
54	2545.502	SERVICE EQUIPMENT	EACH	$1,300.00	**2**	**$2,600.00**	1	$1,300.00	1	$1,300.00				
55	2545.502	HANDHOLE	EACH	$950.00	**16**	**$15,200.00**	8	$7,600.00	8	$7,600.00				
56	2545.503	1-1/2" NON-METALLIC CONDUIT	LF	$6.00	**7,000**	**$42,000.00**	2500	$15,000.00	4500	$27,000.00				
57	2545.503	UNDERGROUND WIRE 1/C 4 AWG	LF	$1.80	**14,400**	**$25,920.00**	5185	$9,333.00	9215	$16,587.00				
58	2545.503	UNDERGROUND WIRE 1/C 8 AWG	LF	$1.40	**7,200**	**$10,080.00**	2592	$3,628.80	4608	$6,451.20				
59	2545.503	UNDERGROUND WIRE 1/C 12 AWG	LF	$1.05	**1,890**	**$1,984.50**	680	$714.00	1210	$1,270.50				
60	2554.603	F&I GUARDRAIL	LF	$50.00	**290**	**$14,500.00**			290	$14,500.00				
61	2563.601	TRAFFIC CONTROL	LS	$7,000.00	**1**	**$7,070.00**	0.26	$1,820.00	0.54	$3,780.00	0.04	$280.00	0.17	$1,190.00
62	2564.502	INSTALL SIGN PANEL TYPE SPECIAL	EACH	$150.00	**22**	**$3,300.00**	1.00	$150.00	14.00	$2,100.00	7.00	$1,050.00		
63	2564.618	F & I SIGN PANELS TYPE C	SF	$45.00	**304**	**$13,691.25**	126.75	$5,703.75	177.50	$7,987.50				

N OWASSO/ARBOGAST PRELIMINARY ENGINEER'S ESTIMATE

					TOTAL		COUNTY PARK TO SOO ST		ARBOGAST/ N OWASSO TO PARK		COUNTY PARTICIPATING		BMP	
	ITEM			UNIT	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED
LINE	NO.	ITEM DESCRIPTION	UNIT	PRICE	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST
64	2571.602	SHRUB AS SPECIFIED	SHRUB	$60.00	**57**	**$3,420.00**	19	$1,140.00	38	$2,280.00				
65	2571.602	TREE AS SPECIFIED	TREE	$450.00	**49**	**$22,050.00**	7	$3,150.00	42	$18,900.00				
66	2573.501	STABILIZED CONSTRUCTION EXIT	LS	$2,500.00	**1**	**$2,525.00**	0.26	$650.00	0.54	$1,350.00	0.04	$100.00	0.17	$425.00
67	2573.503	SILT FENCE, TYPE MACHINE SLICED	LF	$2.00	**3,450**	**$6,900.00**	575	$1,150.00	1725	$3,450.00	1150	$2,300.00		
68	2573.503	FLOTATION SILT CURTAIN TYPE STILL WATER	LF	$10.00	**200**	**$2,000.00**	100	$1,000.00	100	$1,000.00				
69	2574.507	RAIN GARDEN MIX	CY	$80.00	**866**	**$69,280.00**							866	$69,280.00
70	2575.604	EROSION CONTROL BLANKET CATEGORY 3	SY	$2.00	**1,200**	**$2,400.00**			1200	$2,400.00				
71	2575.604	SODDING TYPE LAWN (W/ 6" TOPSOIL)	SY	$7.00	**22,031**	**$154,217.00**	8337	$58,359.00	13694	$95,858.00				
72	2582.503	4" SOLID LINE PAINT (WHITE)(PARKING LOTS)	LF	$2.00	**1,010**	**$2,020.00**					1010	$2,020.00		
73	2582.503	4" SOLID LINE MULTI COMP (WHITE)	LF	$2.00	**11,667**	**$23,334.00**	3667	$7,334.00	8000	$16,000.00				
74	2582.503	4" DBLE SOLID LINE MULTI COMP (YELLOW)	LF	$3.00	**5,572**	**$16,716.00**	1920	$5,760.00	3652	$10,956.00				
					STREET SUBTOTAL =	**$3,313,260.00**		$1,114,275.30		$1,507,059.95		$177,481.00		$514,443.75
					+5% CONTINGENCY =	**$165,663.00**		$55,713.77		$75,353.00		$8,874.05		$25,722.19
					STREET SUBTOTAL + CONTINGENCY =	**$3,478,923.00**		$1,169,989.07		$1,582,412.95		$186,355.05		$540,165.94
					+25% INDIRECT =	**$869,730.75**		$292,497.27		$395,603.24		$46,588.76		$135,041.48
					TOTAL ESTIMATED STREET COST =	**$4,348,653.75**		$1,462,486.33		$1,978,016.18		$232,943.81		$675,207.42

N OWASSO/ARBOGAST PRELIMINARY ENGINEER'S ESTIMATE

					TOTAL		COUNTY PARK TO SOO ST		ARBOGAST/ N OWASSO TO PARK		COUNTY PARTICIPATING		BMP	
LINE	ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST
SECTION B: STORM SEWER														
75	2104.503	REMOVE PIPE CULVERT	LF	$7.00	**167**	**$1,169.00**	138	$966.00	29	$203.00				
76	2104.503	REMOVE SEWER PIPE (STORM)	LF	$10.00	**2,952**	**$29,520.00**	394	$3,940.00	2558	$25,580.00				
77	2104.502	REMOVE CASTING AND COVER	EACH	$125.00	**36**	**$4,500.00**	7	$875.00	29	$3,625.00				
78	2104.502	REMOVE DRAINAGE STRUCTURE	EACH	$400.00	**32**	**$12,800.00**	7	$2,800.00	25	$10,000.00				
79	2105.603	ABANDON SEWER PIPE (STORM)	LF	$20.00	**290.00**	**$5,800.00**			290	$5,800.00				
80	2105.604	GEOTEXTILE FABRIC, TYPE IV	SY	$3.25	**657.00**	**$2,135.25**			657	$2,135.25				
81	2105.604	40-MIL LLDPE MEMBRANE	SY	$5.00	**333.00**	**$1,665.00**			333	$1,665.00				
82	2123.611	STREET SWEEPING (W/ PICKUP BROOM)	DAY	$275.00	**40.00**	**$11,000.00**	20	$5,500.00	20	$5,500.00				
83	2451.609	CRUSHED ROCK FOR STABILIZATION	CY	$40.00	**118.00**	**$4,720.00**			118	$4,720.00				
84	2451.609	MANHOLES SUBSURFACE SOIL IMPROVEMENT & STRUCTURAL AGG	CY	$40.00	**100.00**	**$4,000.00**							100	$4,000.00
85	SPEC	SAND TRENCH UNDERDRAIN (RWG CENTERLINE)	CY	$30.00	**250.00**	**$7,500.00**							250	$7,500.00
86	SPEC	RAINWATER GARDEN FILTRATION SOIL	CY	$42.00	**444.00**	**$18,648.00**							444	$18,648.00
87	2501.602	SPLASH BLOCK APRON/BASIN	EACH	$700.00	**9.00**	**$6,300.00**							9	$6,300.00
88	2501.602	12" RCP HEADWALL END SECTIONS	EACH	$400.00	**7.00**	**$2,800.00**							7	$2,800.00
89	2501.602	18" RCP HEADWALL END SECTIONS	EACH	$500.00	**3.00**	**$1,500.00**							3	$1,500.00
90	2501.602	36" RC APRON W/ TRASH GUARD	EACH	$2,500.00	**1.00**	**$2,500.00**			1	$2,500.00				
91	2501.602	48" RC APRON W/ TRASH GUARD	EACH	$3,500.00	**1.00**	**$3,500.00**			1	$3,500.00				
92	2502.503	18" PERF HDPE PIPE SEWER (SMOOTH)	LF	$25.00	**463.00**	**$11,575.00**			463	$11,575.00				
93	2502.503	24" PERFORATED CPEP, DUAL WALL EXFILTRATION PIPE	LF	$40.00	**380.00**	**$15,200.00**							380	$15,200.00
94	2503.503	6" PERFORATED CPEP UNDERDRAIN	LF	$8.00	**900.00**	**$7,200.00**							900	$7,200.00
95	2503.503	12" CL54 DIP STORM SEWER	LF	$70.00	**170.00**	**$11,900.00**							170	$11,900.00
96	2503.503	18" CL54 DIP STORM SEWER W/ AGG. BEDDING	LF	$150.00	**110.00**	**$16,500.00**							110	$16,500.00
97	2503.503	12" RC PIPE SEWER DES 3006 CL V	LF	$30.00	**315.00**	**$9,450.00**			315	$9,450.00				
98	2503.503	15" RC PIPE SEWER DES 3006 CL V	LF	$32.00	**963.00**	**$30,816.00**			963	$30,816.00				
99	2503.503	18" RC PIPE SEWER DES 3006 CL V	LF	$32.00	**163.00**	**$5,216.00**			103	$3,296.00			60	$1,920.00
100	2503.503	24" RC PIPE SEWER DES 3006 CL III	LF	$42.00	**630.00**	**$26,460.00**							630	$26,460.00
101	2503.503	30" RC PIPE SEWER DES 3006 CL III	LF	$55.00	**417.00**	**$22,935.00**			317	$17,435.00			100	$5,500.00
102	2503.503	36" RC PIPE SEWER DES 3006 CL III	LF	$75.00	**63.00**	**$4,725.00**			63	$4,725.00				
103	2503.503	42" RC PIPE SEWER DES 3006 CL III	LF	$110.00	**856.00**	**$94,160.00**			856	$94,160.00				
104	2503.503	48" RC PIPE SEWER DES 3006 CL III	LF	$125.00	**150.00**	**$18,750.00**			150	$18,750.00				
105	2506.502	CONST DRAINAGE STRUCTURE DESIGN K	EACH	$1,500.00	**13.00**	**$19,500.00**			13	$19,500.00				
106	2506.502	CONST DRAINAGE STRUCTURE DES 48-4020	EACH	$2,000.00	**13.00**	**$26,000.00**			13	$26,000.00				
107	2506.502	CONST DRAINAGE STRUCTURE DES 48-4020 W/ SUMP	EACH	$2,750.00	**1.00**	**$2,750.00**			1	$2,750.00				
108	2506.502	48" PRECAST CONCRETE CB MANHOLE W/ SUMP (COMPLETE)	EACH	$3,000.00	**4.00**	**$12,000.00**							4	$12,000.00
109	2506.502	CONST DRAINAGE STRUCTURE DES 54-4020	EACH	$3,000.00	**2.00**	**$6,000.00**			2	$6,000.00				
110	2506.502	CONST DRAINAGE STRUCTURE DES 60-4020	EACH	$3,200.00	**4.00**	**$12,800.00**			4	$12,800.00				
111	2506.502	60" PRECAST CONCRETE CB MANHOLE (COMPLETE)	EACH	$6,000.00	**2.00**	**$12,000.00**							2	$12,000.00
112	2506.502	CONST DRAINAGE STRUCTURE DES 60-4020 W/ SUMP	EACH	$4,000.00	**1.00**	**$4,000.00**			1	$4,000.00				
113	2506.502	60" PRECAST CONCRTE CB MANHOLE W/ SUMP, BAFFLE (COMPLETE)	EACH	$7,000.00	**4.00**	**$28,000.00**							4	$28,000.00
114	2506.502	CONST DRAINAGE STRUCTURE DES 72-4020	EACH	$4,500.00	**5.00**	**$22,500.00**			5	$22,500.00				
115	2506.502	72" PRECAST CONCRETE CB MANHOLE W/ SUMP, BAFFLE (COMPLETE)	EACH	$8,000.00	**2.00**	**$16,000.00**							2	$16,000.00
116	2506.502	CONST DRAINAGE STRUCTURE DES 84-4020	EACH	$5,700.00	**3.00**	**$17,100.00**			3	$17,100.00				
117	2506.602	F & I CASTING ASSEMBLY (NEENAH R4353)	EACH	$180.00	**1.00**	**$180.00**			1	$180.00				
118	2506.602	F & I CASTING ASSEMBLY (NEENAH R-3246)	EACH	$650.00	**35.00**	**$22,750.00**			35	$22,750.00				
119	2506.602	F & I CASTING ASSEMBLY (NEENAH R-1733)	EACH	$725.00	**1.00**	**$725.00**			1	$725.00				
120	2503.602	CONNECT TO EXISTING STORM SEWER PIPE	EACH	$800.00	**5.00**	**$4,000.00**			5	$4,000.00				
121	2511.507	RANDOM RIPRAP CLASS III	CY	$85.00										
122	2573.502	STORM DRAIN INLET PROTECTION	EACH	$130.00	**62.00**	**$8,060.00**			50	$6,500.00			12	$1,560.00
123	2573.503	SEDIMENT CONTROL LOG TYPE STRAW	LF	$3.50	**1,200.00**	**$4,200.00**	600	$2,100.00	600	$2,100.00				
124	SPEC	F & I MANHOLE BAFFLE	SF	$400.00	**24.00**	**$9,600.00**			24	$9,600.00				
125	SPEC	RAINWATER GARDEN SEEDING AND PLUG PLANTINGS (1 PLUG 12" O.C. E.W.)	SF	$12.00	**15,000.00**	**$180,000.00**							15000	$180,000.00
126	SPEC	RAINWATER GARDEN ECB (JUTE AND STRAW)	SF	$3.00	**15,000.00**	**$45,000.00**							15000	$45,000.00
					STORM SEWER SUBTOTAL =	**$848,109.25**		$16,181.00		$411,940.25				$419,988.00
					+5% CONTINGENCY =	**$42,405.46**		$809.05		$20,597.01				$20,999.40
					STORM SEWER SUBTOTAL + CONTINGENCY =	**$890,514.71**		$16,990.05		$432,537.26				$440,987.40
					+25% INDIRECT =	**$222,628.68**		$4,247.51		$108,134.32				$110,246.85
					TOTAL ESTIMATED STORM SEWER COST =	**$1,113,143.39**		$21,237.56		$540,671.58				$551,234.25

N OWASSO/ARBOGAST PRELIMINARY ENGINEER'S ESTIMATE

					TOTAL		COUNTY PARK TO SOO ST		ARBOGAST/ N OWASSO TO PARK		COUNTY PARTICIPATING		BMP	
LINE	ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST
SECTION C: WATER MAIN														
125	2104.502	REMOVE GATE VALVE AND BOX	EACH	$275.00	**4**	**$1,100.00**	4	$1,100.00						
126	2104.503	REMOVE WATER MAIN	LF	$7.00	**5,120**	**$35,840.00**	1224	$8,568.00	3896	$27,272.00				
127	2104.509	REMOVE/SALVAGE HYDRANT & VALVE	EACH	$450.00	**11**	**$4,950.00**	6	$2,700.00	5	$2,250.00				
128	2504.601	TEMPORARY WATER SYSTEM	LS	$20,000.00	**1**	**$20,000.00**	0.32	$6,400.00	0.68	$13,600.00				
129	2504.602	CONNECT TO EXISTING WATERMAIN	EACH	$1,000.00	**19**	**$19,000.00**	3	$3,000.00	16	$16,000.00				
130	2504.602	AIR RELIEF MANHOLE	EACH	$5,000.00	**1**	**$5,000.00**			1	$5,000.00				
131	2504.602	F & I HYDRANT	EACH	$4,500.00	**12**	**$54,000.00**	7	$31,500.00	5	$22,500.00				
132	2504.602	1" CORPORATION STOP	EACH	$250.00	**32**	**$8,000.00**	5	$1,250.00	27	$6,750.00				
133	2504.602	6" GATE VALVE AND BOX	EACH	$1,600.00	**12**	**$19,200.00**	7	$11,200.00	5	$8,000.00				
134	2504.602	8" GATE VALVE AND BOX	EACH	$2,100.00	**10**	**$21,000.00**	4	$8,400.00	6	$12,600.00				
135	2504.602	12" GATE VALVE AND BOX	EACH	$4,000.00	**2**	**$8,000.00**	2	$8,000.00						
136	2504.602	1" CURB STOP AND BOX	EACH	$450.00	**32**	**$14,400.00**	5	$2,250.00	27	$12,150.00				
137	2504.603	1" POLYETHYLENE SERVICE PIPE	LF	$32.00	**1,286**	**$41,152.00**	341	$10,912.00	945	$30,240.00				
138	2504.603	6" WATER MAIN-DUCT IRON CL 53	LF	$28.00	**125**	**$3,500.00**	96	$2,688.00	29	$812.00				
139	2504.603	8" PVC WATERMAIN (C900)	LF	$34.00	**5,294**	**$179,996.00**	**1076**	$36,584.00	4218	$143,412.00				
140	2504.604	4" POLYSTYRENE INSULATION	SY	$38.00	**60**	**$2,280.00**	30	$1,140.00	30	$1,140.00				
141	2504.608	DUCTILE IRON FITTINGS (EPOXY COATED)	LB	$6.25	**3,353**	**$20,956.25**	1762	$11,012.50	1591	$9,943.75				
				WATER MAIN SUBTOTAL =		**$458,374.25**		$146,704.50		$311,669.75				
				+5% CONTINGENCY =		**$22,918.71**		$7,335.23		$15,583.49				
		WATER MAIN SUBTOTAL + CONTINGENCY =				**$481,292.96**		$154,039.73		$327,253.24				
		+25% INDIRECT =				**$120,323.24**		$38,509.93		$81,813.31				
		TOTAL ESTIMATED WATER MAIN COST =				**$601,616.20**		$192,549.66		$409,066.55				

N OWASSO/ARBOGAST PRELIMINARY ENGINEER'S ESTIMATE

					TOTAL		COUNTY PARK TO SOO ST		ARBOGAST/ N OWASSO TO PARK		COUNTY PARTICIPATING		BMP	
	ITEM			UNIT	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED
LINE	NO.	ITEM DESCRIPTION	UNIT	PRICE	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST
SECTION D: SANITARY SEWER														
142	2104.503	REMOVE PIPE SEWERS	LF	$10.00	**2,180**	**$21,800.00**	730	$7,300.00	1450	$14,500.00				
143	2104.509	REMOVE MANHOLE	EACH	$2,000.00	**2**	**$4,000.00**	2	$4,000.00						
144	2104.509	REMOVE CASTING AND COVER	EACH	$150.00	**36**	**$5,400.00**	10	$1,500.00	26	$3,900.00				
145	2503.602	REMOVE & REPLACE 8"x4" WYE	EACH	$25.00	**18**	**$450.00**	7	$175.00	11	$275.00				
146	2503.602	REMOVE & REPLACE 12"x4" WYE	EACH	$50.00	**3**	**$150.00**			3	$150.00				
147	2503.602	REMOVE & REPLACE 15"x4" WYE	EACH	$60.00	**5**	**$300.00**			5	$300.00				
148	2503.602	REMOVE & REPLACE 18"x4" WYE	EACH	$80.00	**5**	**$400.00**			5	$400.00				
149	2503.602	4" PVC CLEANOUT	EACH	$25.00	**33**	**$825.00**	7	$175.00	26	$650.00				
150	2503.602	CONNECT TO EXISTING SANITARY SEWER SERVICE	EACH	$25.00	**31**	**$775.00**	7	$175.00	24	$600.00				
151	2503.603	4" PVC SANITARY SERVICE PIPE	LF	$25.00	**1,181**	**$29,525.00**	341	$8,525.00	840	$21,000.00				
152	2503.603	8" PVC PIPE SEWER	LF	$30.00	**1,609**	**$48,270.00**	**342**	$10,260.00	1267	$38,010.00				
153	2503.603	12" PVC PIPE SEWER	LF	$40.00	**1,250**	**$50,000.00**			1250	$50,000.00				
154	2503.603	15" PVC PIPE SEWER	LF	$45.00	**902**	**$40,590.00**	705	$31,725.00	197	$8,865.00				
155	2506.516	F & I CASTING ASSEMBLY (NEENAH R-1733)	EACH	$850.00	**37**	**$31,450.00**	11	$9,350.00	26	$22,100.00				
155	2506.602	CONSTRUCT SANITARY MANHOLE	EACH	$2,500.00	**24**	**$60,000.00**	7	$17,500.00	17	$42,500.00				
156	2506.602	CONNECT TO EXISTING STRUCTURE	EACH	$1,000.00	**3**	**$3,000.00**	3	$3,000.00						
157	2506.603	RECONSTRUCT MANHOLE STRUCTURE	LF	$400.00	**21**	**$8,400.00**			21	$8,400.00				
					SANITARY SEWER SUBTOTAL =	**$279,535.00**		$82,385.00		$197,150.00				
					+5% CONTINGENCY =	**$13,976.75**		$4,119.25		$9,857.50				
		SANITARY SEWER SUBTOTAL + CONTINGENCY =				**$293,511.75**		$86,504.25		$207,007.50				
					+25% INDIRECT =	**$73,377.94**		$21,626.06		$51,751.88				
		TOTAL ESTIMATED SANITARY SEWER COST =				**$366,889.69**		$108,130.31		$258,759.38				
		TOTAL ESTIMATED BASE BID COST =				**$6,430,303.03**		**$1,784,403.86**		**$3,186,513.68**		**$232,943.81**		**$1,226,441.67**

Appendix B

Assessments

NORTH OWASSO BOULEVARD RECONSTRUCTION
CITY PROJECT 19-07
PROPOSED ASSESSMENT ROLL - FEASIBILITY STUDY

T = 10-year assessment
F = 15-year assessment

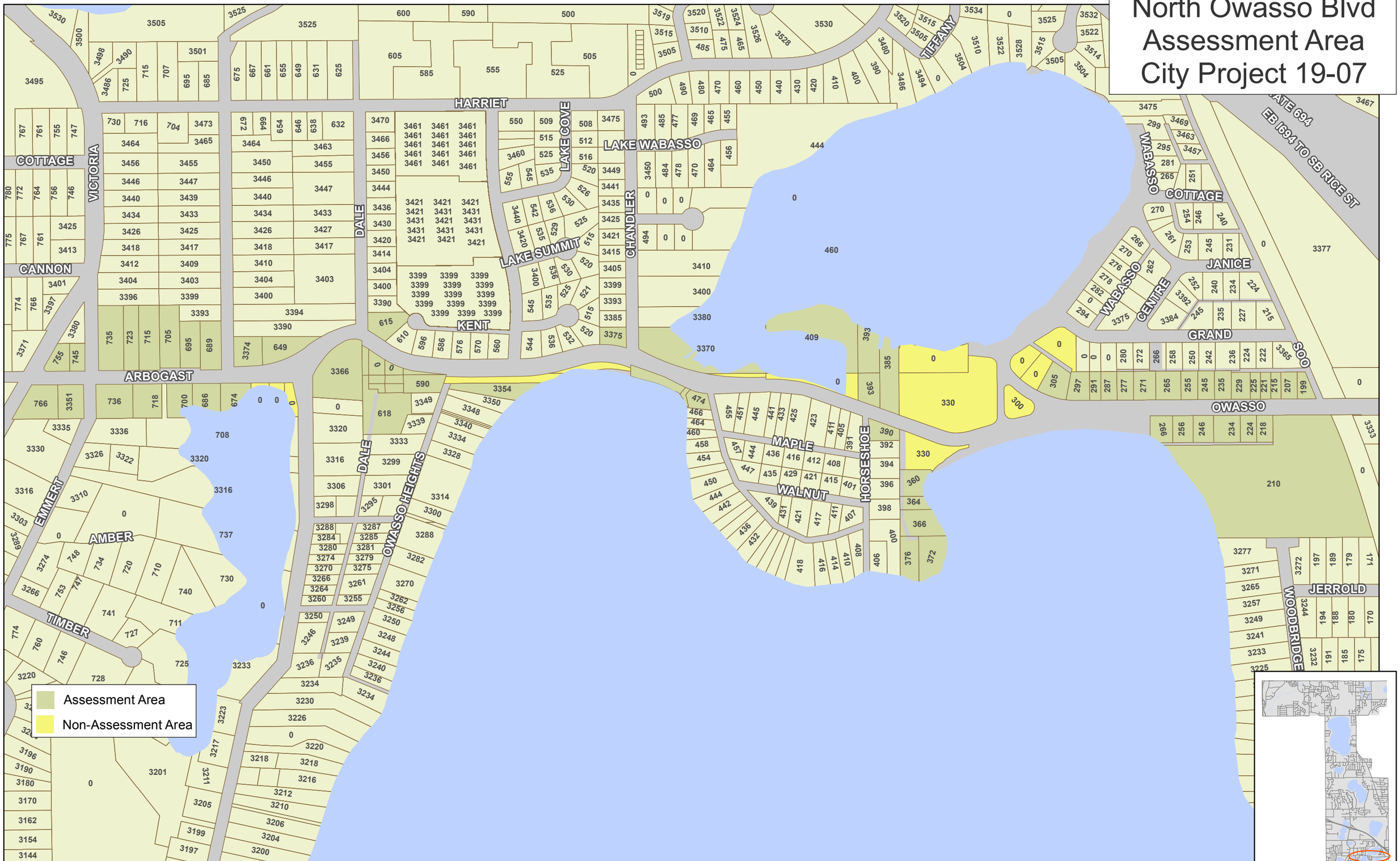
ASSESSMENTS			Street			Storm				Water				Sanitary				
Address	PIN		Units	$/Lot Unit	Total Street	Lot Area	Assessed Area	Storm Rate	Total Storm	Assess Units	Trunk Water Facility Charge	$/Lot Unit	Total Water	Assess Units	$/Lot Unit	Total Sanitary	Total Assessment	*
199 N Owasso Blvd	363023410043		0.5	$ 1,600.00	$ 800.00	8,777	8,777	$0.07	$ 614.39	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,414.39	T
207 N Owasso Blvd	363023410042		1.0	$ 1,600.00	$ 1,600.00	10,402	10,402	$0.07	$ 728.14	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,328.14	T
215 N Owasso Blvd	363023410051		1.0	$ 1,600.00	$ 1,600.00	12,998	12,998	$0.07	$ 909.86	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,509.86	T
221 N Owasso Blvd	363023410050		1.0	$ 1,600.00	$ 1,600.00	6,499	6,499	$0.07	$ 454.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,054.93	T
225 N Owasso Blvd	363023410040		1.0	$ 1,600.00	$ 1,600.00	6,499	6,499	$0.07	$ 454.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,054.93	T
229 N Owasso Blvd	363023410039		1.0	$ 1,600.00	$ 1,600.00	11,700	11,700	$0.07	$ 819.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,419.00	T
235 N Owasso Blvd	363023410054		1.0	$ 1,600.00	$ 1,600.00	11,478	11,478	$0.07	$ 803.46	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,403.46	T
245 N Owasso Blvd	363023410053		1.0	$ 1,600.00	$ 1,600.00	11,478	11,478	$0.07	$ 803.46	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,403.46	T
255 N Owasso Blvd	363023410052		1.0	$ 1,600.00	$ 1,600.00	11,478	11,478	$0.07	$ 803.46	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,403.46	T
265 N Owasso Blvd	363023420018		1.0	$ 1,600.00	$ 1,600.00	17,219	17,219	$0.07	$ 1,057.67	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,657.67	T
271 N Owasso Blvd	363023420019		1.0	$ 1,600.00	$ 1,600.00	15,398	15,398	$0.07	$ 993.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,593.93	T
277 N Owasso Blvd	363023420020		1.0	$ 1,600.00	$ 1,600.00	11,199	11,199	$0.07	$ 783.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,383.93	T
287 N Owasso Blvd	363023420005		1.0	$ 1,600.00	$ 1,600.00	11,199	11,199	$0.07	$ 783.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,383.93	T
291 N Owasso Blvd	363023420006		1.0	$ 1,600.00	$ 1,600.00	7,710	7,710	$0.07	$ 539.70	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,139.70	T
297 N Owasso Blvd	363023420007		1.0	$ 1,600.00	$ 1,600.00	14,375	14,375	$0.07	$ 958.13	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,558.13	T
305 N Owasso Blvd	363023420008		1.0	$ 1,600.00	$ 1,600.00	18,600	18,600	$0.07	$ 1,106.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,706.00	T
210 N Owasso Blvd	363023410049		3.0	$ 1,600.00	$ 4,800.00	421,660	57,000	$0.07	$ 3,360.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 8,160.00	F
218 N Owasso Blvd	363023410033		1.0	$ 1,600.00	$ 1,600.00	10,402	10,402	$0.07	$ 728.14	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,328.14	T
224 N Owasso Blvd	363023410034		1.0	$ 1,600.00	$ 1,600.00	10,410	10,410	$0.07	$ 728.70	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,328.70	T
234 N Owasso Blvd	363023410035		1.0	$ 1,600.00	$ 1,600.00	16,901	16,901	$0.07	$ 1,046.54	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,646.54	T
246 N Owasso Blvd	363023410036		1.0	$ 1,600.00	$ 1,600.00	12,998	12,998	$0.07	$ 909.86	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,509.86	T
256 N Owasso Blvd	363023410037		1.0	$ 1,600.00	$ 1,600.00	12,998	12,998	$0.07	$ 909.86	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,509.86	T
266 N Owasso Blvd	363023420001		1.0	$ 1,600.00	$ 1,600.00	12,763	12,763	$0.07	$ 893.41	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,493.41	T
360 N Owasso Blvd	363023420012		1.0	$ 1,600.00	$ 1,600.00	20,995	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
364 N Owasso Blvd	363023420013		1.0	$ 1,600.00	$ 1,600.00	10,149	10,149	$0.07	$ 710.43	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,310.43	T
366 N Owasso Blvd	363023420014		1.0	$ 1,600.00	$ 1,600.00	30,099	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
372 N Owasso Blvd	363023420015		1.0	$ 1,600.00	$ 1,600.00	34,721	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
376 N Owasso Blvd	363023420016		1.0	$ 1,600.00	$ 1,600.00	18,526	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
385 N Owasso Blvd	363023310078		1.0	$ 1,600.00	$ 1,600.00	25,378	25,378	$0.07	$ 1,343.23	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,943.23	T
390 N Owasso Blvd	363023310005		0.5	$ 1,600.00	$ 800.00	12,401	0	$0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
393 N Owasso Blvd	363023240007		1.0	$ 1,600.00	$ 1,600.00	43,560	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
409 N Owasso Blvd	363023240006		1.0	$ 1,600.00	$ 1,600.00	157,500	19,000	$0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T

NORTH OWASSO BOULEVARD RECONSTRUCTION
CITY PROJECT 19-07
PROPOSED ASSESSMENT ROLL - FEASIBILITY STUDY

T = 10-year assessment
F = 15-year assessment

ASSESSMENTS			Street			Storm				Water				Sanitary			Street Water/Storm	
Address		PIN	Units	$/Lot unit	Total Street	Lot Area	Assessed Area	Storm Rate	Total Storm	Assess Units	Trunk Water Facility Charge	$/Lot Unit	Total Water	Assess Units	$/Lot Unit	Total Sanitary	Total Assessment	*
474 N Owasso	Blvd	363023310075	0.5	$ 1,600.00	$ 800.00	9,078	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
0 N Owasso	Blvd	363023310073	1.5	$ 1,600.00	$ 2,400.00	13,153	13,153	$ 0.035	$ 457.68	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,857.68	T
590 N Owasso	Blvd	363023320040	0.5	$ 1,600.00	$ 800.00	17,359	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
0 N Owasso	Blvd	363023230283	1.0	$ 1,600.00	$ 1,600.00	12,467	12,467	$ 0.07	$ 872.69	1.0	$ 773.00	$ 2,400.00	$ 3,173.00	1.0	$ 2,300.00	$ 2,300.00	$ 7,945.69	F
0 N Owasso	Blvd	363023230282	1.0	$ 1,600.00	$ 1,600.00	14,374	14,374	$ 0.07	$ 958.09	1.0	$ 736.00	$ 2,400.00	$ 3,136.00	1.0	$ 2,300.00	$ 2,300.00	$ 7,994.09	F
615 N Owasso	Blvd	363023230258	0.5	$ 1,600.00	$ 800.00	18,082	18,082	$ 0.07	$ 1,087.87	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,887.87	T
618 N Owasso	Blvd	363023320052	1.0	$ 1,600.00	$ 1,600.00	48,356	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
649 Arbogast	St	353023140066	1.0	$ 1,600.00	$ 1,600.00	25,800	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
689 Arbogast	St	353023140060	0.5	$ 1,600.00	$ 800.00	24,657	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,920.00	T
695 Arbogast	St	353023140061	1.0	$ 1,600.00	$ 1,600.00	22,708	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
705 Arbogast	St	353023140040	1.0	$ 1,600.00	$ 1,600.00	31,202	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
715 Arbogast	St	353023140041	1.0	$ 1,600.00	$ 1,600.00	32,200	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
723 Arbogast	St	353023140042	1.0	$ 1,600.00	$ 1,600.00	24,150	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
735 Arbogast	St	353023140043	1.0	$ 1,600.00	$ 1,600.00	40,249	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
745 Arbogast	St	353023130093	1.0	$ 1,600.00	$ 1,600.00	10,079	10,079	$ 0.07	$ 705.53	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,305.53	T
755 Arbogast	St	353023130092	0.5	$ 1,600.00	$ 800.00	12,745	12,745	$ 0.07	$ 892.15	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,692.15	T
674 Arbogast	St	353023410023	1.0	$ 1,600.00	$ 1,600.00	25,051	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
686 Arbogast	St	353023410024	1.0	$ 1,600.00	$ 1,600.00	17,398	17,398	$ 0.07	$ 1,063.93	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,663.93	T
700 Arbogast	St	353023410025	1.0	$ 1,600.00	$ 1,600.00	20,874	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
708 Arbogast	St	353023410029	1.0	$ 1,600.00	$ 1,600.00	41,818	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
718 Arbogast	St	353023410026	1.0	$ 1,600.00	$ 1,600.00	23,549	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 2,720.00	T
736 Arbogast	St	353023410027	0.5	$ 1,600.00	$ 800.00	28,802	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,920.00	T
766 Arbogast	St	353023420053	0.5	$ 1,600.00	$ 800.00	29,569	19,000	$ 0.07	$ 1,120.00	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 1,920.00	T
3370 Chandler	Rd	363023240025	0.5	$ 1,600.00	$ 800.00	117,899	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
3375 Chandler	Rd	363023230014	0.5	$ 1,600.00	$ 800.00	13,255	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
3354 Owasso Hts	Rd	363023320002	0.5	$ 1,600.00	$ 800.00	16,988	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
3366 W Owasso	Blvd	353023140058	0.5	$ 1,600.00	$ 800.00	80,150	0	$ 0.07	$ -	1.0	$ 813.75	$ 2,400.00	$ 3,213.75	0.0	$ -	$ -	$ 4,013.75	T
3374 Owasso	St	353023140065	0.5	$ 1,600.00	$ 800.00	21,009	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
3351 Emmert	St	353023420001	0.5	$ 1,600.00	$ 800.00	21,044	0	$ 0.07	$ -	0.0	$ -	$ -	$ -	0.0	$ -	$ -	$ 800.00	T
Assessable Units & Assessment Totals			56.0		$ 89,600.00				$ 51,684.01				$ 9,522.75			$ 4,600.00	$155,406.76	

North Owasso Blvd Assessment Area City Project 19-07



1 inch = 420 feet

Date: 12/26/2018

Appendix C

Subsurface Soils Exploration and Laboratory Testing Report and Boring Logs

GEOTECHNICAL EXPLORATION AND FACTUAL ENGINEERING REVIEW

North Owasso Boulevard

Shoreview

Minnesota

NTI Project No. 18.MSP06851.000

Prepared For:

SEH
3535 Vadnais Center Drive
St. Paul, Minnesota 55110

NTI™
NORTHERN TECHNOLOGIES, LLC

6160 Carmen Avenue East
Inver Grove Heights, MN 55076
P: 651.389.4191 F: 651.389.4190

www.NTIgeo.com

Unearthing confidence™

November 5, 2018

SEH
3535 Vadnais Center Drive
St. Paul, Minnesota 55110

Attn: Luke Thompson, PE

Subject: Geotechnical Exploration and Factual Engineering Report
North Owasso Boulevard
Shoreview, Minnesota
NTI Project No. 18.MSP06851.000

Dear Mr. Thompson,

In accordance with your request and subsequent authorization, Northern Technologies, LLC (NTI) conducted a Geotechnical Exploration for the above referenced project. Our services included the advancement of exploration borings and preparation of a factual engineering report. Our work was performed in general accordance with our proposal dated September 4, 2018.

Soil samples obtained at the site will be held for 60 days at which time they will be discarded. Please advise us in writing if you wish to have us retain them for a longer period. You will be assessed an additional fee if soil samples are retained beyond 60 days.

We appreciate the opportunity to have been of service on this project. If there are any questions regarding the soils explored or our review and recommendations, please contact us at your convenience at (651) 389-4191.

Northern Technologies, LLC

Robert R. Hawkins, G.I.T.
Staff Geologist

Steven D. Gerber, P.E.
Senior Engineer

1.0 INTRODUCTION

1.1 Scope of Services

The purpose of this factual report is to present a summary of our geotechnical exploration and provide the soil conditions encountered at the project area. Our "scope of services" was limited to the following:

1. Explore the project subsurface by means of 25 Standard Penetration Test (SPT) borings extending to depths of approximately 10 to 20 feet below existing grade.
2. Conduct laboratory testing as requested by a representative of SEH.

2.0 EXPLORATION PROGRAM RESULTS

2.1 Exploration Scope

The field exploration was completed on September 12th through the 13th of 2018. NTI remobilized to the project site on October 8th, 2018 to extend soil borings SB-13, SB-14, SB-15, SB-17, and SB-18 to a depth of approximately 20 feet below existing grade. A representative of SEH marked and surveyed the boring locations prior to mobilization.

The borings were performed by a two-person crew utilizing an Truck mounted CME 55 drill rig. Samples were collected in general accordance with ASTM D 1586 "Standard Test Method for Standard Penetration Testing (SPT) and Split-Barrel Sampling of Soils."

The boreholes were backfilled with auger cuttings, or were abandoned using high solids bentonite or neat cement grout as per appropriate local and state statutes. Minor settlement of the boreholes will occur. Owner is responsible for final closure of the boreholes.

2.2 Subsurface Conditions

The soil profile generally consisted of undocumented fill on top of glacial deposits extending to the termination depth of the borings, locally swamp and lacustrine deposits were encountered. The undocumented fill soils encountered extended to depth ranging between approximately 4.5 to 12 feet below existing grade. Additionally, soil borings SB-13, SB-16, SB-21, SB-24, and SB-25 did not encounter any undocumented fill soils.

These undocumented fill soils generally consisted of poorly graded sand (SP), poorly graded sand with silt (SP-SM), well graded sand with silt (SW-SM), silty sand (SM), clayey sand (SC), and sandy lean clay (CL).

The native soils encountered were variable and consisted of poorly graded sand (SP), poorly graded sand with silt (SP-SM), poorly graded sand with clay (SP-SC), well graded sand with silt (SW-SM), clayey-silty sand (SC-SM), clayey sand (SC), silty sand (SM), silty lean clay (CL-ML), sandy lean clay (CL), organic silt (OL), and peat (PT). Please refer to the boring logs within Appendix B.

2.3 Groundwater Conditions

The drill crew observed the borings for groundwater (if any) during and at the completion of drilling activities. Groundwater was encountered in out soil borings at a depth of approximately 5 to 19 feet below existing grade.

The site soils were conducive to movement of groundwater both laterally and vertically over time. The moisture content of such soils can vary annually and per recent precipitation. Such soils and other regional dependent conditions may produce groundwater entry of project excavations.

3.0 CLOSURE

The scope of services for this project does not include either specifically or by implication any environmental or biological assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of SEH for specific application to the proposed North Owasso Boulevard project in Shoreview, Minnesota. Northern Technologies, LLC has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Northern Technologies, LLC makes no other warranty, expressed or implied.

Northern Technologies, LLC

APPENDIX A

GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES

FIELD EXPLORATION PROCEDURES

GENERAL NOTES

WATER LEVEL SYMBOL

DESCRIPTIVE TERMINOLOGY

RELATIVE PROPORTIONS

PARTICLE SIZES

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES

We visually examined recovered soil samples to estimate distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We then classified the soils according using the Unified Soil Classification System (ASTM D2488). A chart describing this classification system and general notes explaining soil sampling procedures are presented within appendices attachments.

The stratification depth lines between soil types on the logs are estimated based on the available data. In-situ, the transition between type(s) may be distinct or gradual in either the horizontal or vertical directions. The soil conditions have been established at our specific boring locations only. Variations in the soil stratigraphy may occur between and around the borings, with the nature and extent of such change not readily evident until exposed by excavation. These variations must be properly assessed when utilizing information presented on the boring logs.

We request that you, your design team or contractors contact NTI immediately if local conditions differ from those assumed by this report, as we would need to review how such changes impact our recommendations. Such contact would also allow us to revise our recommendations as necessary to account for the changed site conditions.

FIELD EXPLORATION PROCEDURES

Soil Sampling – Standard Penetration Boring:

Soil sampling was performed according to the procedures described by ASTM D-1586. Using this procedure, a 2 inch O.D. split barrel sampler is driven into the soil by a 140-pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an additional 12 inches is recorded (known as the penetration resistance (i.e. “N-value”) of the soil at the point of sampling. The N-value is an index of the relative density of cohesionless soils and an approximation of the consistency of cohesive soils.

Soil Sampling – Power Auger Boring:

The boring(s) was/were advanced with a 6-inch nominal diameter continuous flight auger. As a result, samples recovered from the boring are disturbed, and our determination of the depth, extend of various stratum and layers, and relative density or consistency of the soils is approximate

Soil Classification:

Soil samples were visually and manually classified in general conformance with ASTM D-2488 as they were removed from the sampler(s). Representative fractions of soil samples were then sealed within respective containers and returned to the laboratory for further examination and verification of the field classification. In addition, select samples were submitted for laboratory tests. Individual sample information, identification of sampling methods, method of advancement of the samples and other pertinent information concerning the soil samples are presented on boring logs and related report attachments.

GENERAL NOTES

DRILLING and SAMPLING SYMBOLS		*LABORATORY TEST SYMBOLS*	
SYMBOL	**DEFINITION**	**SYMBOL**	**DEFINITION**
C.S.	Continuous Sampling	W	Moisture content-percent of dry weight
P.D.	2-3/8" Pipe Drill	D	Dry Density-pounds per cubic foot
C.O.	Cleanout Tube	LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
3 HSA	3 ¼" I.D. Hollow Stem Auger	Q_U	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66
4 FA	4" Diameter Flight Auger		
6 FA	6" Diameter Flight Auger		
2 ½ C	2 ½" Casing		
4 C	4" Casing		
D.M.	Drilling Mud	Pq	Penetrometer reading-tons/square foot
J.W.	Jet Water	S	Torvane reading-tons/square foot
H.A.	Hand Auger	G	Specific Gravity – ASTM D 854-58
NXC	Size NX Casing	SL	Shrinkage limit – ASTM 427-61
BXC	Size BX Casing	Ph	Hydrogen ion content-meter method
AXC	Size AX casing	O	Organic content-combustion method
SS	2" O.D. Split Spoon Sample	M.A.	Grain size analysis
2T	2" Thin Wall Tube Sample	C*	One dimensional consolidation
3T	3" Thin Wall Tube Sample	Q_C	Triaxial Compression
		* See attached data Sheet and/or graph	

WATER LEVEL SYMBOL

Water levels shown on the boring logs were determined at the time and under the conditions indicated. In sand, the indicated levels can be considered relatively reliable for most site conditions. In clay soils, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious water bearing soil are present; and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

RELATIVE DENSITY		*CONSISTENCY*	
TERM	**N_{60} Value** (corrected)	**TERM**	**N_{60} Value** (corrected)
Very Loose	0 – 4	Soft	0-4
Loose	5 – 8	Medium	5-8
Medium Dense	9 – 16	Rather Stiff	9 – 15
Dense	16 – 30	Stiff	16 – 30
Very Dense	Over 30	Very Stiff	Over 30

RELATIVE PROPORTIONS

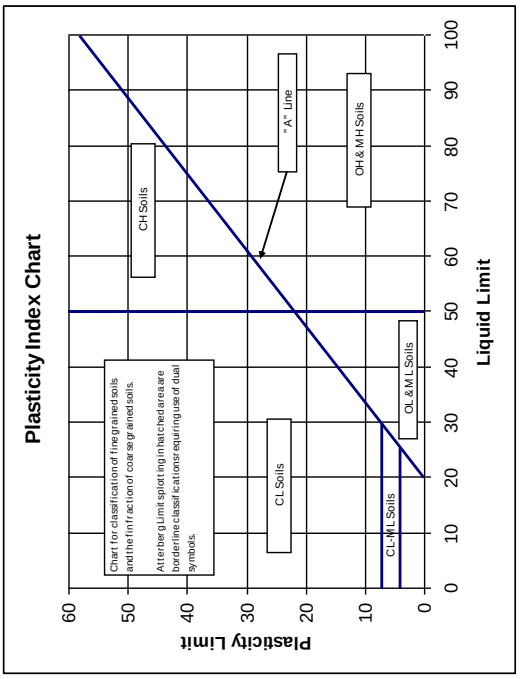
TERMS	**RANGE**
Trace	0 – 5%
A little	5 – 15%
Some	15 – 30%

PARTICLE SIZES

MATERIAL	**DESCRIPTION**	**U.S. SIEVE SIZE**
Boulders		Over 3"
Gravel	Coarse	3" to ¾"
	Medium	¾" to #4
Sand	Coarse	#4 to #10
	Medium	#10 to #40
	Fine	#40 to #200
Silt and Clay	Determined by Hydrometer Test	

CLASSIFICATION of SOILS for ENGINEERING PURPOSES

ASTM Designation D-2487 and D2488 (Unified Soil Classification System)

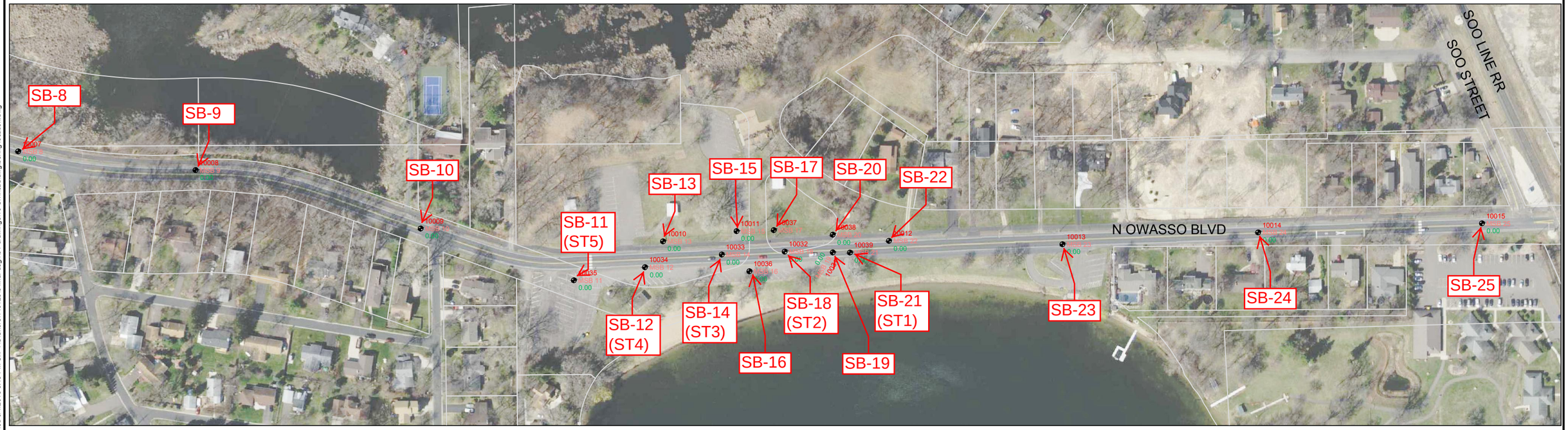
Major Divisions			Group Symbol	Typical Name	Classification Criteria		
Course Grained Soils More than 50% retained on No. 200 sieve *	Gravels 50% or more of coarse fraction retained on No. 4 sieve.	Clean Gravels	**GW**	Well –graded gravels and gravel-sand mixtures, little or no fines.	**Classification on basis of percentage of fines.** Less than 5% passing No. 200 Sieve: GW, GP, SW, SP More than 12% passing No. 200 Sieve: GM, GC, SM, SC From 5% to 12% passing No. 200 Sieve: Borderline Classification requiring use of duel symbols.	Cu = D60 / D10 greater than 4. Cz = (D30)2 / (D10 x D60) between 1 & 3.	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.		Not meeting both criteria for GW materials.	
		Gravels with Fines	**GM**	Silty gravels, gravel-sand-silt mixtures.		Atterberg limits below "A" line, or P.I. less than 4.	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures.		Atterberg limits above "A" line with P.I. greater than 7.	
	Sands More than 50% of coarse fraction passes No 4 sieve.	Clean Sands	**SW**	Well-graded sands and gravelly sands, little or no fines.		Cu = D60 / D10 greater than 6. Cz = (D30)2 / (D10 x D60) between 1 & 3.	
			SP	Poorly-graded sands and gravelly sands, little or no fines.		Not meeting both criteria for SW materials.	
		Sands with Fines	**SM**	Silty sands, sand-silt mixtures.		Atterberg limits below "A" line, or P.I. less than 4.	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.		Atterberg limits above "A" line with P.I. > 7.	
Fine Grained Soils More than 50% passes No. 200 sieve *	Silts and Clays Liquid Limit of 50% or less		**ML**	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.			
			OL	Organic silts and organic silty clays of low plasticity.			
	Silts and Clays Liquid Limit greater than 50%.		**MH**	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.			
			CH	Inorganic clays of high plasticity, fat clays.			
			OH	Organic clays of medium to high plasticity.			
	Highly Organic Soils		**Pt**	Peat, muck and other highly organic soils.			

APPENDIX B

BORING LOCATIONS DIAGRAM

SOIL BORING LOGS

GRADATIONS



SEH
PHONE: 651.490.2000
3535 VADNAIS CENTER DRIVE
ST. PAUL, MN 55110-5196
www.sehinc.com

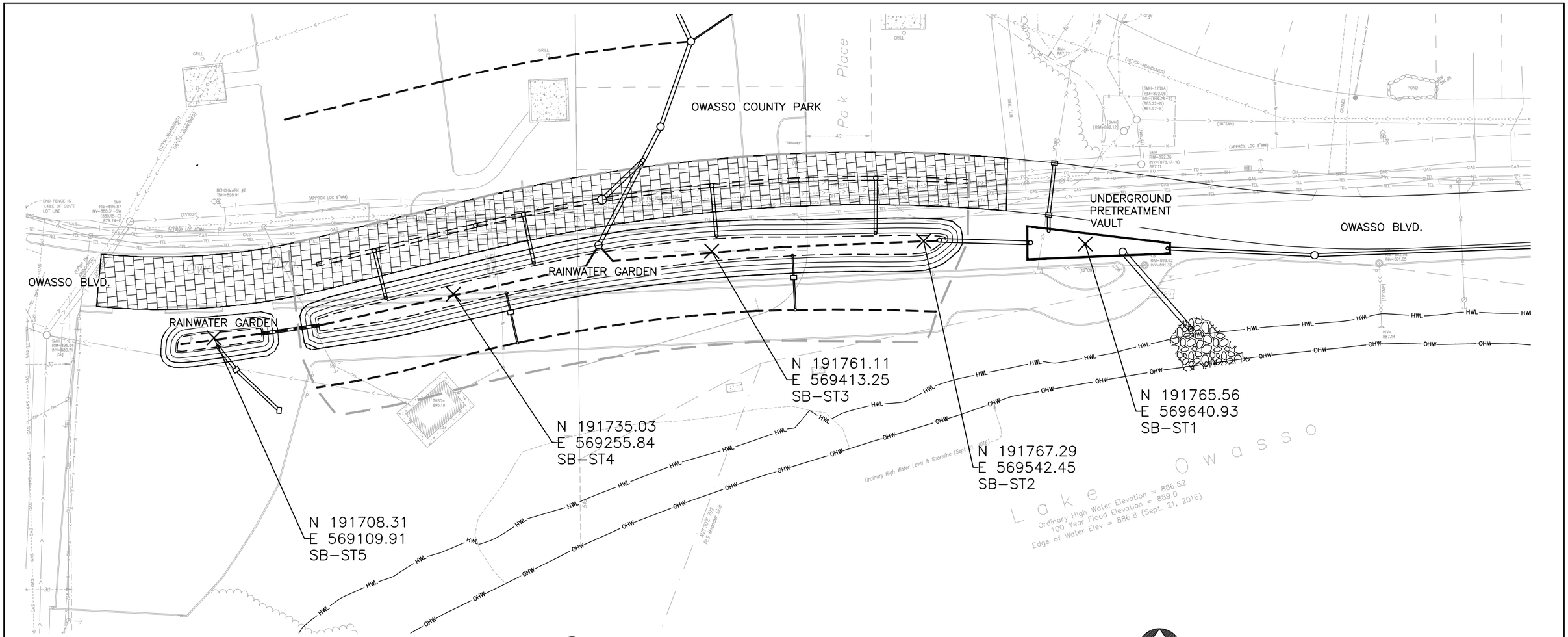
FILE NO. 140128

DATE: 9/4/2018

BORING LOCATION MAP
N OWASSO BOULEVARD
SHOREVIEW, MINNESOTA

EXHIBIT NO. 1

Save: 9/4/2018 3:17 PM abona Plot: 9/4/2018 3:18 PM S:\PT\SI\Shore\140128\5-final-dsgn\51-drawings\10-Civil\cad\dwg\boring location.dwg



1 PLAN: PROPOSED SOIL BORING LOCATIONS – STORMWATER FEATURES

0 30 60
SCALE IN FEET

SUGGESTED LOCATIONS FOR STORMWATER–RELATED SOIL BORINGS AND SOIL LAB ANALYSIS SHOWN ABOVE. DOES NOT INCLUDE BORINGS THAT MAY BE NECESSARY FOR OWASSO BOULEVARD OR PARKING AREAS.

PLEASE VERIFY VERSUS LATEST SURVEY INFORMATION AND UNDERGROUND UTILITY LOCATIONS TO AVOID CONFLICTS

MINIMUM 20–FOOT BORING DEPTH

BORING LOGS TO INCLUDE:
SOIL CLASSIFICATION
BLOW COUNTS
MOISTURE CONDITIONS
GROUNDWATER INFORMATION

CONTROL POINTS				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
1012	SB–ST1		191765.5623	569640.9286
1013	SB–ST2		191767.2929	569542.4475
1014	SB–ST3		191761.1051	569413.2463
1015	SB–ST4		191735.0273	569255.8443
1016	SB–ST5		191708.3135	569109.9130

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME _____

SIGNATURE _____

DATE _____ LICENSE # _____

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT							
BID							
CONSTRUCTION							
PERMITTING							
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1–800–632–2277
Project Office:
BARR ENGINEERING CO.
4300 MARKETPOINTE DRIVE
Suite 200
MINNEAPOLIS, MN 55435
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	8/9/2018
Drawn	MRM
Checked	
Designed	BARR
Approved	

RAMSEY–WASHINGTON
METRO WATERSHED DISTRICT

LAKE OWASSO COUNTY PARK REDEVELOPMENT

PROPOSED SOIL BORING LOCATIONS PLAN

BARR PROJECT No. 23/62–1200.17
CLIENT PROJECT No.
DWG. No. G–SB–1
REV. No. A

Xrefs in Drawing – M:\Design\23621200.17\23621200017_2014 C3D_Base_SEH-4.dwg M:\Design\23621200.17\23621200017_2014 C3D_Base_Ex-TopoV2.dwg M:\Design\23621200.17\23621200017_2014 C3D_Base_BARR.dwg Plot at 20 06/21/2017 13:33:28
ggn M:\Design\23621200.17\23621200017_2014 C3D_Base_RCPRv4_emailed 6–16–2017.dwg

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-1

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 938.517 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 Inches)	937.9										
		1.5 APPARENT AGGREGATE BASE (10 Inches)	937.0	AU 1									
		CLAYEY SAND, (SC) dark brown to bluish brown, moist, trace gravel **(Undocumented Fill)**		SS 2	78	7-3-4 (7)			7				
5		5.0	933.5	SS 3	100	3-4-5 (9)			16				
		SANDY LEAN CLAY, (CL) light brown, moist, trace gravel **(Undocumented Fill)**											
		7.0	931.5										
		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace gravel (Glacial Till)		SS 4	100	4-9-17 (26)			7				
10				SS 5	100	11-17-13 (30)							
		11.0	927.5										

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

NTI NORTHERN TECHNOLOGIES, LLC

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-2

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 931.461 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 Inches) 930.8										
		APPARENT AGGREGATE BASE (14 Inches) 1.8 929.6	AU 1									
		CLAYEY SAND, (SC) reddish brown, fine grained, moist, trace gravel **(Undocumented Fill)**	SS 2	100	4-6-7 (13)			6				25
5		NOTE: Occasional black organic layers below 4.5 feet.	SS 3	100	7-9-6 (15)			5				
			SS 4	100	4-6-7 (13)							
10		11.0 920.5	SS 5	33	4-6-6 (12)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-3

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 932.192 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.6 BITUMINOUS PAVEMENT (7 1/2 Inches)	931.6										
		APPARENT AGGREGATE BASE (12 Inches)		AU 1									
		2.5 CLAYEY SAND, (SC) brown to reddish brown, fine to coarse grained, moist, trace gravel **(Undocumented Fill)**	929.7	SS 2	100	5-6-6 (12)			7				
5				SS 3	100	3-3-4 (7)			11				
				SS 4	100	3-3-3 (6)			13				
		9.5 SANDY LEAN CLAY, (CL) brown to dark brown, moist, trace gravel **(Undocumented Fill)**	922.7										
10		11.0	921.2	SS 5	100	2-2-3 (5)			24				

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-4

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 946.833 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 Inches)	946.2										
		APPARENT AGGREGATE BASE (24 Inches)		AU 1									
		2.7	944.2	SS 2	100	11-7-6 (13)			6				
		CLAYEY SAND, (SC) brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**											
		4.5	942.3										
5		SANDY LEAN CLAY, (CL) reddish brown, moist, rather stiff to medium, trace gravel (Possible Fill)		SS 3	100	8-6-5 (11)			12	20	12	8	
				SS 4	100	3-3-4 (7)			9				
		9.5	937.3										
10		CLAYEY SAND WITH GRAVEL, (SC) reddish brown, fine to coarse grained, moist, dense (Possible Fill)		SS 5	100	8-9-9 (18)							
		11.0	935.8										

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-5

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 942.402 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 1/4 Inches)	941.7										
		2.2 APPARENT AGGREGATE BASE (18 Inches)	940.2	AU 1									
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**		SS 2	100	8-9-9 (18)			2				9
		4.5	937.9										
5		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace gravel (Glacial Till)		SS 3	100	8-9-8 (17)			5				
				SS 4	67	6-7-9 (16)							
10		11.0	931.4	SS 5	100	8-9-9 (18)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-6

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 912.096 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		BITUMINOUS PAVEMENT (9 1/2 Inches)	0.8 / 911.3	AU 1									
		APPARENT AGGREGATE BASE (14 Inches)	2.0 / 910.1										
		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist **(Undocumented Fill)**	4.5 / 907.6	SS 2	100	7-11-12 (23)			4				17
5		CLAYEY SAND, (SC) dark brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**	7.0 / 905.1	SS 3	100	7-2-2 (4)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to medium dense, trace gravel (Glacial Outwash)		SS 4	100	3-3-4 (7)							
10			11.0 / 901.1	SS 5	100	3-5-5 (10)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-7

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 895.06 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 9.50 ft / Elev 885.56 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 Inches)	894.4										
		APPARENT AGGREGATE BASE (18 Inches)		AU 1									
		2.2	892.9										
		SILTY SAND, (SM) brown, fine grained, moist, trace gravel **(Undocumented Fill)**		SS 2	100	8-7-6 (13)			6				23
5													
		5.5	889.6	SS 3	100	8-7-7 (14)							
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, moist, medium dense, trace gravel (Glacial Till)											
		7.0	888.1										
		SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, medium dense to very loose, trace gravel (Glacial Outwash)		SS 4	100	3-5-4 (9)							
10				SS 5	100	3-2-2 (4)							
		11.0	884.1										

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-8

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 891.532 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 9.50 ft / Elev 882.03 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		BITUMINOUS PAVEMENT (10 Inches)	0.8 / 890.7										
		APPARENT AGGREGATE BASE (17 Inches)	2.3 / 889.3	AU 1									
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, trace gravel **(Undocumented Fill)**	4.5 / 887.0	SS 2	100	18-20-24 (44)							
5		CLAYEY SAND, (SC) brown to dark brown, fine to coarse grained, moist, little gravel **(Undocumented Fill)**	7.0 / 884.5	SS 3	100	8-5-5 (10)			9				
		PEAT, (Pt) black, moist, medium, with sand, trace gravel, fibrous (Swamp Deposit)	9.5 ▽ / 882.0	SS 4	100	2-3-3 (6)		33	91				
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, loose, trace gravel, occasional black seams (Lacustrine Deposit)	11.0 / 880.5	SS 5	100	3-4-4 (8)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-9

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 894.559 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.5 BITUMINOUS PAVEMENT (5 1/2 Inches)	894.1										
		APPARENT AGGREGATE BASE (14 Inches) 1.6	892.9	AU 1									
		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, loose, trace gravel **(Undocumented Fill)**		SS 2	100	5-4-3 (7)			11				34
		4.5	890.1										
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose, trace gravel (Glacial Outwash)		SS 3	100	5-4-4 (8)							
				SS 4	100	5-4-4 (8)							
10		11.0	883.6	SS 5	100	3-5-3 (8)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-10

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 894.386 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 7.00 ft / Elev 887.39 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.4 BITUMINOUS PAVEMENT (4 1/4 Inches)	894.0										
		APPARENT AGGREGATE BASE (12 Inches) 1.4	893.0	AU 1									
		SILTY SAND, (SM) brown to light brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**		SS 2	100	3-4-4 (8)			6				16
5		5.0	889.4	SS 3	100	3-4-3 (7)							
		CLAYEY SAND, (SC) black, moist, trace gravel **(Undocumented Fill)**											
		7.0 ▽	887.4	SS 4	100	4-5-7 (12)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown to light brown, fine to medium grained, saturated, medium dense, trace gravel (Glacial Outwash)											
10		10.0	884.4	SS 5	100	8-5-4 (9)							
		SANDY LEAN CLAY, (CL) light brown, wet, rather stiff (Glacial Till) 11.0	883.4										

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
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P: 651-389-4191

BORING NUMBER SB-11

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 896.968 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 7.00 ft / Elev 889.97 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.5 TOPSOIL (6 Inches)	896.5										
		SILTY SAND, (SM) dark brown, fine grained, dry, trace gravel **(Undocumented Fill)** 2.0	895.0	AU 1									
		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel, occasional clay (CL) lenses **(Undocumented Fill)**		SS 2	100	6-4-4 (8)			10				17
5				SS 3	100	6-5-4 (9)							
		7.0 ▽	890.0										
		SILTY SAND, (SM) dark brown, fine to medium grained, saturated, trace gravel **(Undocumented Fill)**		SS 4	67	8-9-11 (20)							
		9.5	887.5										
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, dense, trace gravel (Glacial Outwash) 11.0	886.0	SS 5	89	9-9-11 (20)			19				12

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

NTI NORTHERN TECHNOLOGIES, LLC

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-12

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 896.338 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.3 BITUMINOUS PAVEMENT (3 1/2 Inches)	896.0										
		APPARENT AGGREGATE BASE (12 Inches) 1.3	895.0	AU 1									
		SILTY SAND, (SM) dark brown, fine to medium grained, moist, little gravel **(Undocumented Fill)**		SS 2	100	8-6-6 (12)			11				17
		4.5	891.8										
5		WELL GRADED SAND WITH SILT, (SW-SM) brown, fine to coarse grained, moist, medium dense, trace gravel (Glacial Outwash)		SS 3	100	5-5-6 (11)			6				9
		7.0	889.3										
		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, little gravel (Glacial Till)		SS 4	100	7-8-7 (15)			10				17
10				SS 5	100	7-9-6 (15)							
		11.0	885.3										

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-13

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 10/8/18
GROUND ELEVATION 895.052 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 7.00 ft / Elev 888.05 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.3 TOPSOIL (4 Inches) 894.7										
		SILTY SAND, (SM) light brown, fine grained, moist, dense, trace gravel (Glacial Outwash)	AU 1									
			SS 2	100	8-9-11 (20)			5				17
5			SS 3	100	7-9-8 (17)							
		7.0 ▽ 888.1										
		CLAYEY SAND, (SC) reddish brown, wet, very loose, little gravel (Glacial Till)	SS 4	100	2-1-2 (3)			7				33
10			SS 5	100	1-1-2 (3)			9				
		11.0 884.1										
		SANDY LEAN CLAY, (CL) gray, wet, soft, trace gravel, occasional reddish brown layering (Glacial Till)										
			SS 6	56	1-1-1 (2)			20	29	14	15	
15												
		17.0 878.1										
		CLAYEY-SILTY SAND, (SC-SM) reddish brown, wet, very loose to medium dense, trace gravel (Glacial Till)	SS 7	56	1-2-2 (4)			13	17	12	5	
20			SS 8	78	4-6-6 (12)			12				
		21.0 874.1										

Borehole extended on 10/8/18 from 11 feet to 21 feet.
Bottom of borehole at 21.0 feet.

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Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-14

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 10/8/18
GROUND ELEVATION 895.073 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		BITUMINOUS PAVEMENT (10 Inches) 0.8 / 894.2										
		APPARENT AGGREGATE BASE (14 Inches) 2.0 / 893.1	AU 1									
		CLAYEY SAND, (SC) brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)** 4.0 / 891.1	SS 2	100	2-3-4 (7)							
5		SILTY SAND WITH GRAVEL, (SM) brown, moist **(Undocumented Fill)** 7.0 / 888.1	SS 3	100	3-5-5 (10)			7				12
		SILTY LEAN CLAY, (CL-ML) brown to light brown, moist, rather stiff to medium, trace gravel (Glacial Till) 13.0 / 882.1	SS 4	100	6-6-5 (11)			16				
10			SS 5	100	3-4-4 (8)			16	21	15	6	
		SANDY LEAN CLAY, (CL) gray, moist, rather stiff, trace gravel (Glacial Till)	SS 6	89	7-8-7 (15)			17	26	15	11	
15			SS 7	89	5-7-7 (14)							
20		NOTE: Bluish gray below 19.5 feet. 21.0 / 874.1	SS 8	89	4-4-7 (11)			19				

Borehole extended on 10/8/18 from 11 feet to 21 feet.
Bottom of borehole at 21.0 feet.

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Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-15

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 10/8/18
GROUND ELEVATION 892.939 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 8.50 ft / Elev 884.44 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.3 TOPSOIL (3 Inches)	892.7										
		SILTY SAND, (SM) dark brown, fine to medium grained, dry, trace gravel **(Undocumented Fill)**		AU 1									
		2.0	890.9										
		SILTY SAND, (SM) dark brown, fine to coarse grained, moist, little gravel **(Undocumented Fill)**		SS 2	100	8-4-3 (7)			5				14
		4.5	888.4										
5		SILTY SAND, (SM) dark brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**		SS 3	100	5-3-2 (5)			14				14
		7.0	885.9										
		SILTY SAND, (SM) dark brown to black, fine grained, moist to saturated, very loose to loose, trace gravel, occasional organic clay (OH) layers (Swamp Deposit) NOTE: Organic content at 7 feet = 1.9%.		SS 4	100	3-2-1 (3)			26				12
10				SS 5	100	3-1-5 (6)			20				13
		13.0	879.9										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, loose, trace gravel (Glacial Outwash)		SS 6	78	3-4-2 (6)							
15		15.5	877.4										
		CLAYEY SAND, (SC) reddish brown, fine to medium grained, wet, medium dense to dense, trace gravel (Glacial Till)		SS 7	100	3-5-8 (13)							
				SS 8	78	4-7-13 (20)							
		19.5	873.4										

Borehole extended on 10/8/18 from 11 feet to 19.5 feet.
Bottom of borehole at 19.5 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-16

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 894.885 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 9.50 ft / Elev 885.39 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.6 BITUMINOUS PAVEMENT (7 1/4 Inches)	894.3										
		APPARENT AGGREGATE BASE (14 Inches) 1.8	893.1	AU 1									
		SILTY SAND, (SM) light brown to brown, fine to medium grained, moist, medium dense, trace gravel (Glacial Outwash)		SS 2	100	6-6-7 (13)			4				14
5				SS 3	100	7-5-5 (10)							
				SS 4	100	7-5-4 (9)			7				16
		9.5 ▽	885.4										
10		SILTY SAND, (SM) brown to light brown, fine to coarse grained, saturated, medium dense, little gravel (Glacial Till) 11.0	883.9	SS 5	100	7-8-8 (16)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-17

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 10/8/18
GROUND ELEVATION 892.851 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 13.00 ft / Elev 879.85 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0											
0.5 (892.4)	TOPSOIL (6 Inches)										
	SILTY SAND, (SM) dark brown, fine to medium grained, dry, trace gravel **(Undocumented Fill)**	AU 1									
2.0 (890.9)	SILTY SAND, (SM) brown, fine grained, moist, trace gravel, occasional black organic seams **(Undocumented Fill)**	SS 2	100	3-4-4 (8)			11				14
5		SS 3	100	2-1-3 (4)			17				13
		SS 4	100	2-2-2 (4)							
9.5 (883.4)	PEAT, (Pt) black, moist, soft, with sand, trace gravel, fibrous (Swamp Deposit)	SS 5	100	1-2-1 (3)		16	270				
10											
13.0 (879.9)	SILTY SAND, (SM) bluish gray, fine grained, saturated, loose, trace gravel (Glacial Outwash)	SS 6	100	4-3-3 (6)							
15		SS 7	89	2-3-5 (8)							
18.0 (874.9)	CLAYEY SAND, (SC) bluish gray, wet, loose, trace gravel (Glacial Till)	SS 8	56	3-4-4 (8)							
19.5 (873.4)											

Borehole extended on 10/8/18 from 11 feet to 19.5 feet.
Bottom of borehole at 19.5 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:32 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

NTI NORTHERN TECHNOLOGIES, LLC

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-18

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 10/8/18
GROUND ELEVATION 894.258 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 9.50 ft / Elev 884.76 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.6 BITUMINOUS PAVEMENT (7 1/4 Inches)	893.7										
		APPARENT AGGREGATE BASE (24 Inches)		AU 1									
		2.6	891.7										
		SILTY SAND, (SM) dark brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**		SS 2	56	4-8-6 (14)			9				31
5				SS 3	100	4-11-14 (25)			7				20
		7.0	887.3										
		PEAT, (Pt) black, moist, soft, with sand, trace gravel, fibrous (Swamp Deposit)		SS 4	100	4-1-2 (3)		24	160				
		9.5 ▽	884.8										
10		SILTY SAND, (SM) dark brown, fine grained, saturated, loose to medium dense, trace gravel (Glacial Outwash)		SS 5	100	3-7-8 (15)							
				SS 6	56	9-4-4 (8)							
15				SS 7	89	3-4-5 (9)							
20				SS 8	89	5-7-8 (15)							
		21.0	873.3										

Borehole extended on 10/8/18 from 11 feet to 21 feet.
Bottom of borehole at 21.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:33 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-19

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 894.059 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 7.00 ft / Elev 887.06 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (7 3/4 Inches)	893.4										
		APPARENT AGGREGATE BASE (14 Inches) 1.8	892.2	AU 1									
		POORLY GRADED SAND, (SP) light brown, fine grained, moist, trace gravel **(Undocumented Fill)** 4.5	889.6	SS 2	100	2-3-2 (5)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, saturated, trace gravel, occasional bituminous debris **(Undocumented Fill)** 7.0 ▽	887.1	SS 3	22	8-11-12 (23)			9				7
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, loose, trace gravel (Glacial Outwash)		SS 4	100	3-2-3 (5)							
10		11.0	883.1	SS 5	100	2-3-2 (5)							

Bottom of borehole at 11.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:33 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-20

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 892.42 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 5.00 ft / Elev 887.42 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.3 TOPSOIL (4 Inches)	892.1										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown to dark brown, fine grained, moist, trace gravel **(Undocumented Fill)**	2.0 890.4	AU 1					16				10
		SILTY SAND, (SM) dark brown, fine to medium grained, moist to saturated, trace gravel, occasional black lenses **(Undocumented Fill)**		SS 2	100	6-5-5 (10)			9				12
5		▽		SS 3	100	2-4-4 (8)							
				SS 4	100	2-3-4 (7)							
			9.5 882.9										
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown to gray, fine to medium grained, saturated, loose, trace gravel (Glacial Outwash)		SS 5	100	5-4-4 (8)							
				SS 6	100	4-4-3 (7)							
15				SS 7	100	3-4-2 (6)							
			17.0 875.4										
		POORLY GRADED SAND WITH CLAY, (SP-SC) gray, fine to coarse grained, saturated, loose, trace gravel (Glacial Outwash)		SS 8	100	3-3-3 (6)							
			19.5 872.9										
20		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, loose, trace gravel (Glacial Outwash)	21.0 871.4	SS 9	100	4-3-4 (7)							

Bottom of borehole at 21.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:33 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-21

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 893.98 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 10.00 ft / Elev 883.98 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0	0.3 BITUMINOUS PAVEMENT (4 Inches) 893.7										
	APPARENT AGGREGATE BASE (13 Inches) 1.3 892.7	AU 1									
	WELL GRADED SAND WITH SILT, (SW-SM) light brown, fine to medium grained, moist, medium dense, trace gravel (Glacial Outwash)	SS 2	78	5-5-5 (10)							
5		SS 3	78	2-4-4 (8)			3				6
		SS 4	78	4-4-5 (9)							
	9.5 884.5										
10	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, medium dense, trace gravel (Glacial Outwash)	SS 5	78	6-5-5 (10)							
		SS 6	89	4-4-5 (9)							
	14.5 879.5										
15	POORLY GRADED SAND WITH CLAY, (SP-SC) gray, fine to coarse grained, saturated, medium dense, trace gravel (Glacial Outwash)	SS 7	89	4-5-6 (11)							
	17.0 877.0										
	POORLY GRADED SAND, (SP-SM) brown, fine to coarse grained, saturated, medium dense, trace gravel (Glacial Outwash)	SS 8	89	4-5-5 (10)							
20	21.0 873.0	SS 9	89	5-6-4 (10)							

Bottom of borehole at 21.0 feet.

NTI LOG - GENERAL (USE THIS ONE) - NTI-2017-09-14.GDT - 11/8/18 14:33 - R:\RAMSEY\1-PROJECTS\2018 PROJECTS\NORTH OWASSO BOULEVARD_GEO_18.MSP_06851.000\TESTING REPORTS\GINT\NORTH OWASSO BLVD (2).GPJ

Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-22

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/12/18 **COMPLETED** 9/12/18
GROUND ELEVATION 893.657 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 12.00 ft / Elev 881.66 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0	0.7 BITUMINOUS PAVEMENT (8 Inches) 893.0										
	1.3 APPARENT AGGREGATE BASE (8 Inches) 892.3	AU 1									
	POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine grained, moist, trace gravel, occasional dark brown to black seams **(Undocumented Fill)**	SS 2	100	10-6-4 (10)			3				7
5		SS 3	100	4-3-2 (5)							
	7.0 886.7										
	PEAT, (Pt) black, moist, soft, with sand, trace gravel, fibrous (Swamp Deposit)	SS 4	100	2-1-2 (3)		32	122				
	9.5 884.2										
10	ORGANIC SILT, (OL) black, moist, soft, with sand, trace gravel (Swamp Deposit)	SS 5	100	2-2-2 (4)		92	25	31	24	7	
	12.0 ▽ 881.7										
	SILTY SAND, (SM) dark brown, fine grained, saturated, loose, trace gravel, trace organics (Lacustrine Deposit)	SS 6	100	2-3-3 (6)							
	14.5 879.2										
15	CLAYEY SAND, (SC) bluish brown, saturated, very loose, trace gravel (Lacustrine Deposit) NOTE: Grades to white below 15.5 feet.	SS 7	100	3-3-1 (4)							
	17.0 876.7										
	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, very loose, trace gravel (Lacustrine Deposit)	SS 8	100	2-2-2 (4)							
20		SS 9	100	2-2-2 (4)							
	21.0 872.7										

Bottom of borehole at 21.0 feet.

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Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-23

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 893.789 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 10.00 ft / Elev 883.79 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.4 BITUMINOUS PAVEMENT (4 1/4 Inches) 893.4										
		APPARENT AGGREGATE BASE (12 Inches) 1.4 892.4	AU 1									
		WELL GRADED SAND WITH SILT, (SW-SM) brown to dark brown, fine to medium grained, moist, trace gravel **(Undocumented Fill)**	SS 2	100	4-6-6 (12)			5				9
		4.5 889.3										
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown to dark brown, fine to medium grained, moist to saturated, trace gravel **(Undocumented Fill)**	SS 3	100	6-6-5 (11)							
		NOTE: No recovery in sample 4 due to gravel.	SS 4	0	4-3-4 (7)							
10		▽	SS 5	100	4-4-3 (7)							
		12.0 881.8										
		POORLY GRADED SAND, (SP) brown to dark brown, fine to medium grained, saturated, loose, trace gravel (Glacial Outwash)	SS 6	100	3-3-4 (7)							
15			SS 7	100	3-3-4 (7)							
		NOTE: Grades to gray below 17 feet.	SS 8	100	3-3-4 (7)							
		19.0 874.8										
20		POORLY GRADED SAND WITH CLAY, (SP-SC) gray, fine to medium grained, saturated, loose, trace gravel (Glacial Outwash)	SS 9	100	4-4-3 (7)							
		21.0 872.8										

Bottom of borehole at 21.0 feet.

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Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-24

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 907.313 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING 19.00 ft / Elev 888.31 ft
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.4 BITUMINOUS PAVEMENT (4 1/2 Inches)	906.9										
		0.9 APPARENT AGGREGATE BASE (6 Inches)	906.4										
		SILTY SAND, (SM) brown, fine grained, moist, medium dense to loose, trace gravel (Possible Fill)		AU 1									
				SS 2	100	4-7-4 (11)			4				13
5				SS 3	100	3-4-3 (7)							
		7.0	900.3										
		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel (Glacial Till)		SS 4	100	5-5-5 (10)							
10				SS 5	100	4-5-4 (9)							
		12.0	895.3										
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, moist to saturated, medium dense to loose, trace gravel, occasional clay (CL) lenses (Glacial Outwash)		SS 6	100	4-5-5 (10)							
15				SS 7	100	4-3-5 (8)							
				SS 8	100	5-6-6 (12)							
20				SS 9	100	6-5-6 (11)							
		21.0	886.3										

Bottom of borehole at 21.0 feet.

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Inver Grove Heights
6160 Carmen Avenue East
Inver Grove Heights, MN, 55076
P: 651-389-4191

BORING NUMBER SB-25

CLIENT SEH, Inc
PROJECT NAME North Owasso Boulevard
PROJECT NUMBER 18.MSP06851.000
PROJECT LOCATION Shoreview, MN
DATE STARTED 9/13/18 **COMPLETED** 9/13/18
GROUND ELEVATION 924.618 feet **HOLE SIZE** 6 1/2 in.
DRILLING CONTRACTOR NTI
GROUND WATER LEVELS:
DRILLING METHOD 3 1/4 in H.S.A
AT TIME OF DRILLING --- No Groundwater Observed.
LOGGED BY RRH **CHECKED BY** SDG
AT END OF DRILLING ---
CAVE IN (ft) --- **FROST DEPTH (ft)** ---
AFTER DRILLING ---
NOTES Elevation provided by SEH.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES
0		0.7 BITUMINOUS PAVEMENT (8 Inches)	924.0										
		1.0 APPARENT AGGREGATE BASE (4 Inches)	923.6	AU 1									
		SILTY SAND, (SM) brown to light brown, fine grained, moist, trace gravel (Glacial Till)		SS 2	100	4-3-4 (7)			4				14
5		NOTE: Brown to light brown below 4.5 feet.		SS 3	100	6-6-7 (13)							
				SS 4	100	6-6-8 (14)							
		9.5	915.1										
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense, trace gravel (Glacial Outwash)		SS 5	100	6-6-5 (11)							
				SS 6	100	6-6-5 (11)							
		14.5	910.1										
15		POORLY GRADED SAND, (SP) light brown, fine grained, moist, medium dense to dense, trace gravel (Glacial Outwash)		SS 7	100	5-5-6 (11)							
				SS 8	100	5-6-5 (11)							
20		21.0	903.6	SS 9	100	9-8-9 (17)							

Bottom of borehole at 21.0 feet.

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

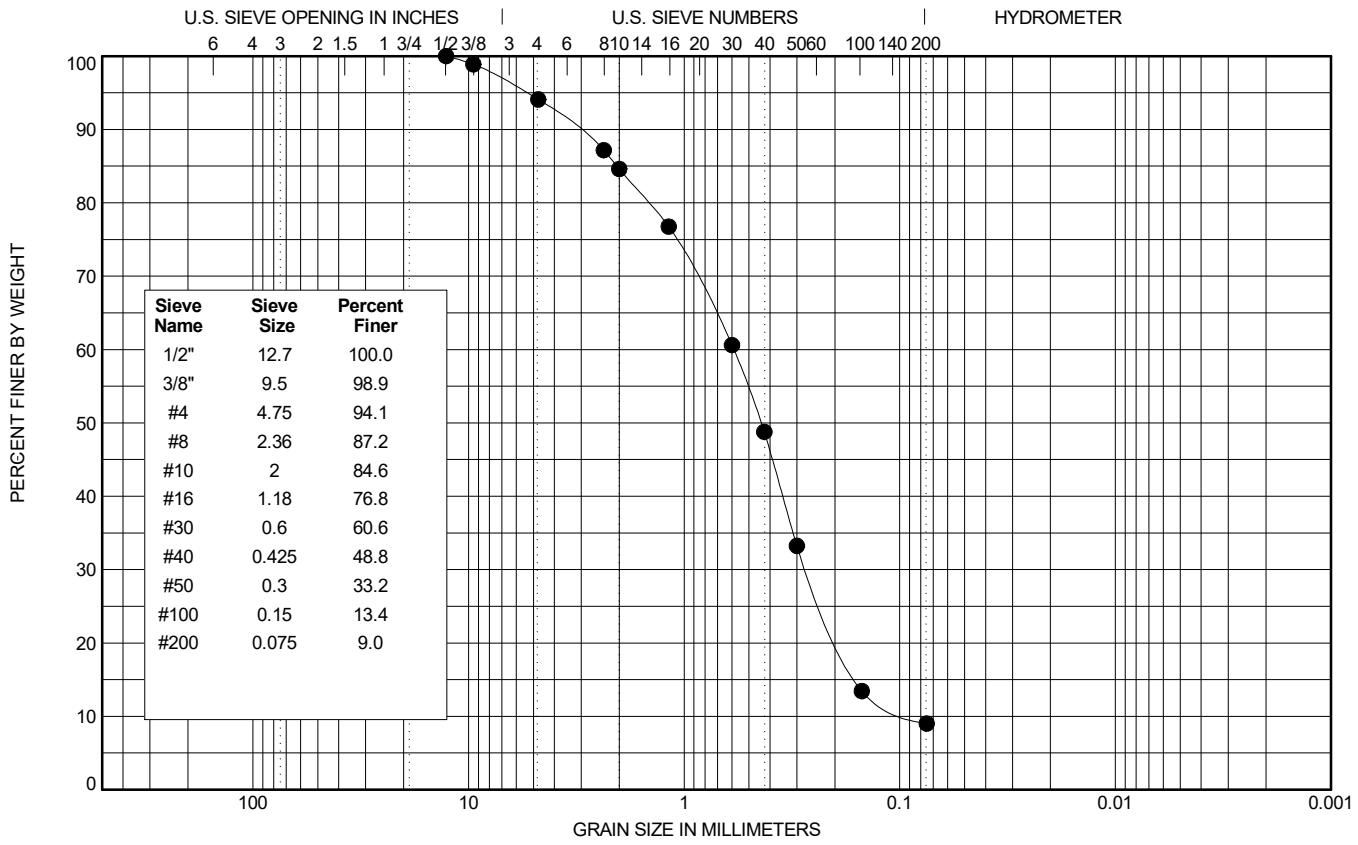
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-5	Date Sampled:	9/12/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Poorly Graded Sand with Silt (SP-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
1.39	6.74	12.7	0.589	0.268	0.087	5.9	85.1	9.0	



Sieve Name	Sieve Size	Percent Finer
1/2"	12.7	100.0
3/8"	9.5	98.9
#4	4.75	94.1
#8	2.36	87.2
#10	2	84.6
#16	1.18	76.8
#30	0.6	60.6
#40	0.425	48.8
#50	0.3	33.2
#100	0.15	13.4
#200	0.075	9.0

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

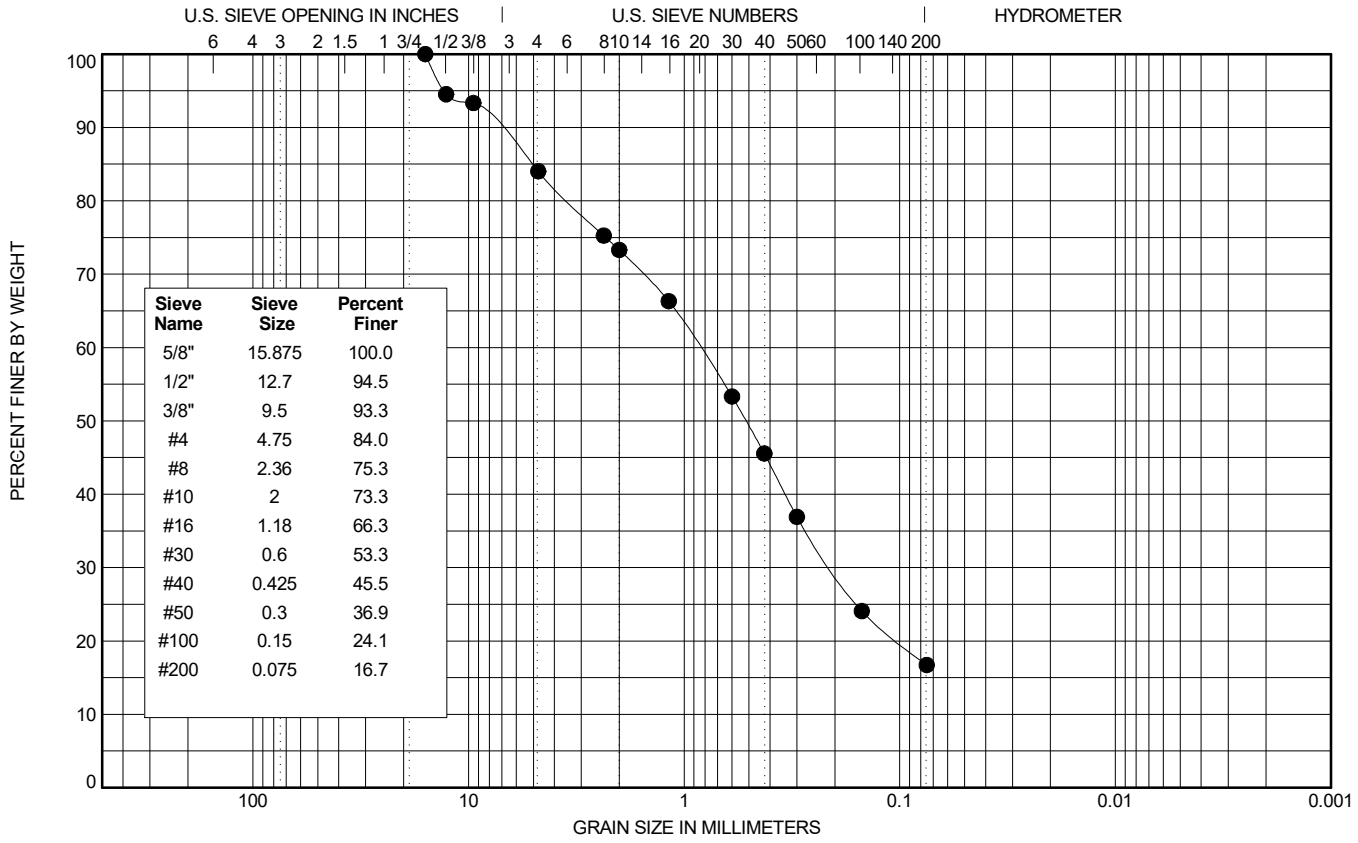
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-6	Date Sampled:	9/12/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand with Gravel (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		15.875	0.849	0.207		16.0	67.3	16.7	



Sieve Name	Sieve Size	Percent Finer
5/8"	15.875	100.0
1/2"	12.7	94.5
3/8"	9.5	93.3
#4	4.75	84.0
#8	2.36	75.3
#10	2	73.3
#16	1.18	66.3
#30	0.6	53.3
#40	0.425	45.5
#50	0.3	36.9
#100	0.15	24.1
#200	0.075	16.7

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

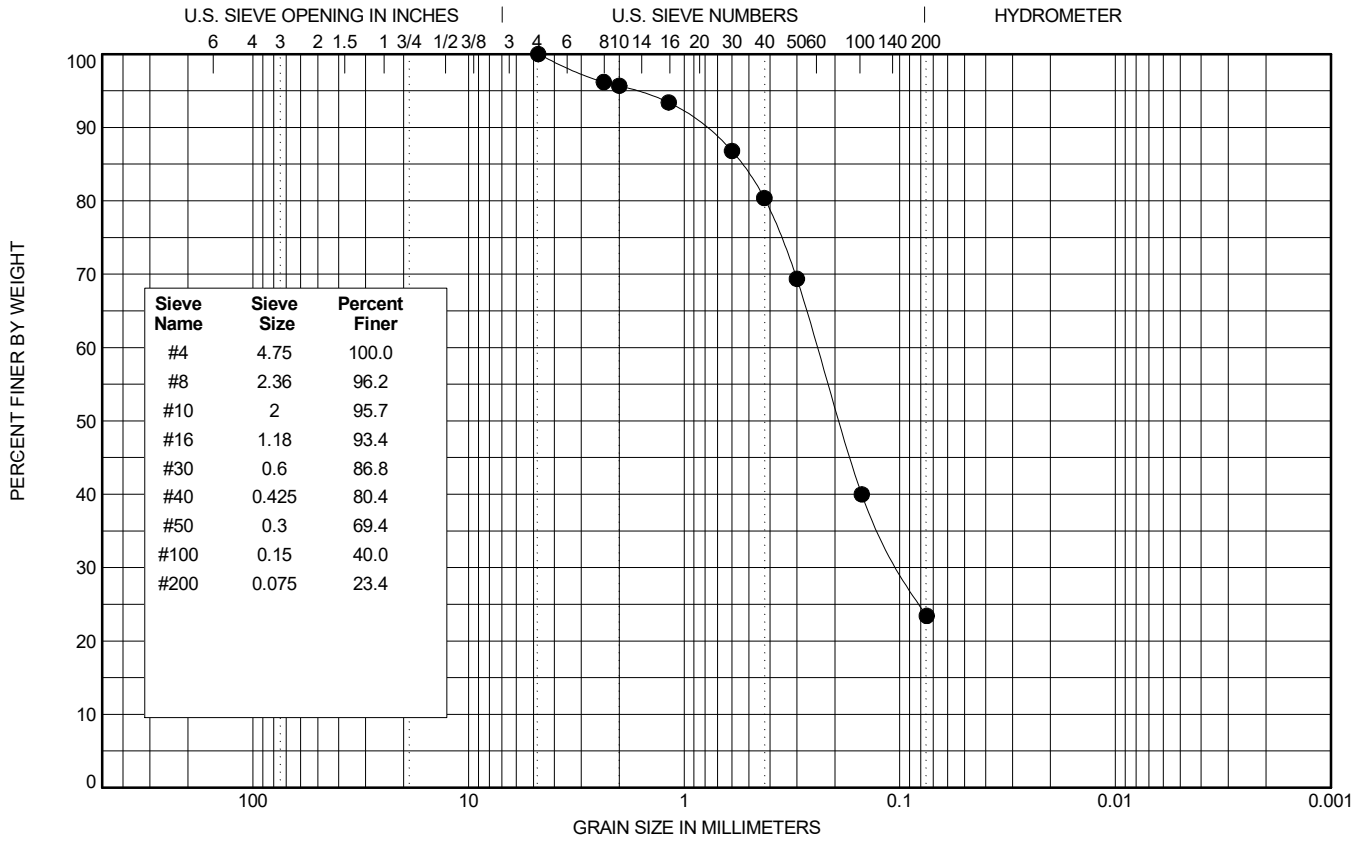
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-7	Date Sampled:	9/12/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		4.75	0.241	0.099		0.0	76.6	23.4	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	96.2
#10	2	95.7
#16	1.18	93.4
#30	0.6	86.8
#40	0.425	80.4
#50	0.3	69.4
#100	0.15	40.0
#200	0.075	23.4

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

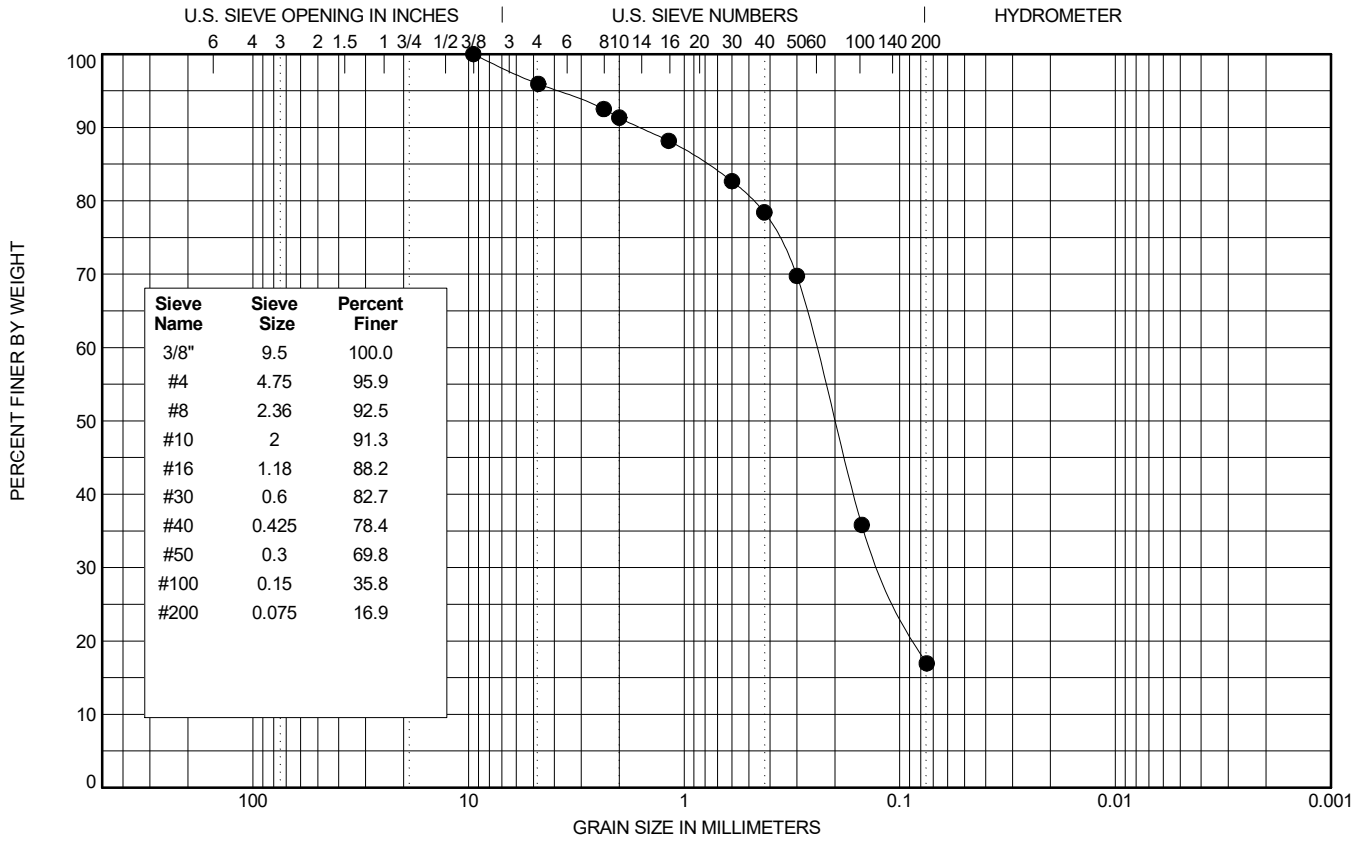
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-11	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		9.5	0.246	0.121		4.1	79.0	16.9	



Sieve Name	Sieve Size	Percent Finer
3/8"	9.5	100.0
#4	4.75	95.9
#8	2.36	92.5
#10	2	91.3
#16	1.18	88.2
#30	0.6	82.7
#40	0.425	78.4
#50	0.3	69.8
#100	0.15	35.8
#200	0.075	16.9

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

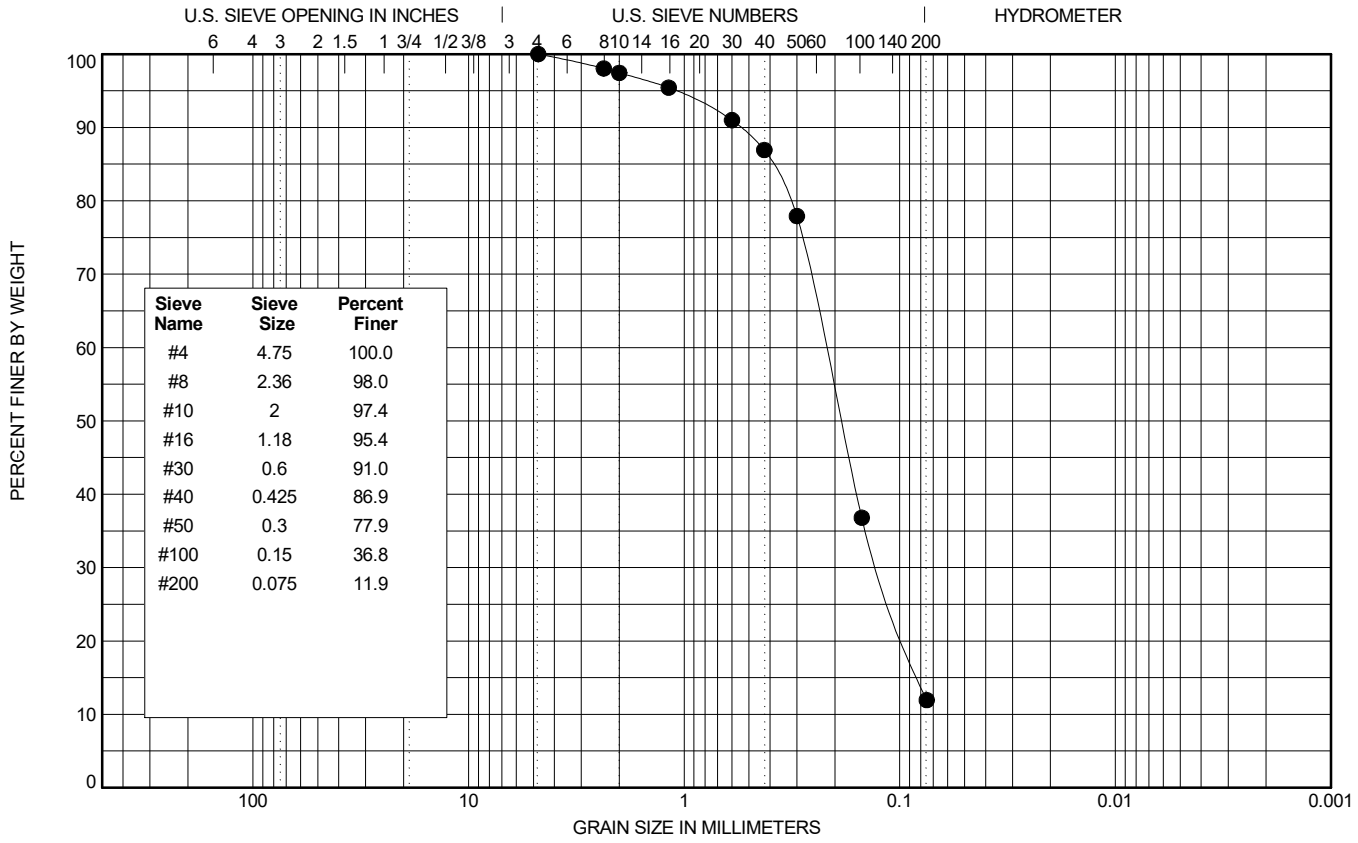
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-11	Date Sampled:	9/13/2018
Sample Number:	5	Sampled By:	NTI
Sample Depth:	9.5	Sample Type:	SS
Classification:	Poorly Graded Sand with Silt (SP-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
0.98	3.12	4.75	0.222	0.124		0.0	88.1	11.9	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	98.0
#10	2	97.4
#16	1.18	95.4
#30	0.6	91.0
#40	0.425	86.9
#50	0.3	77.9
#100	0.15	36.8
#200	0.075	11.9

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

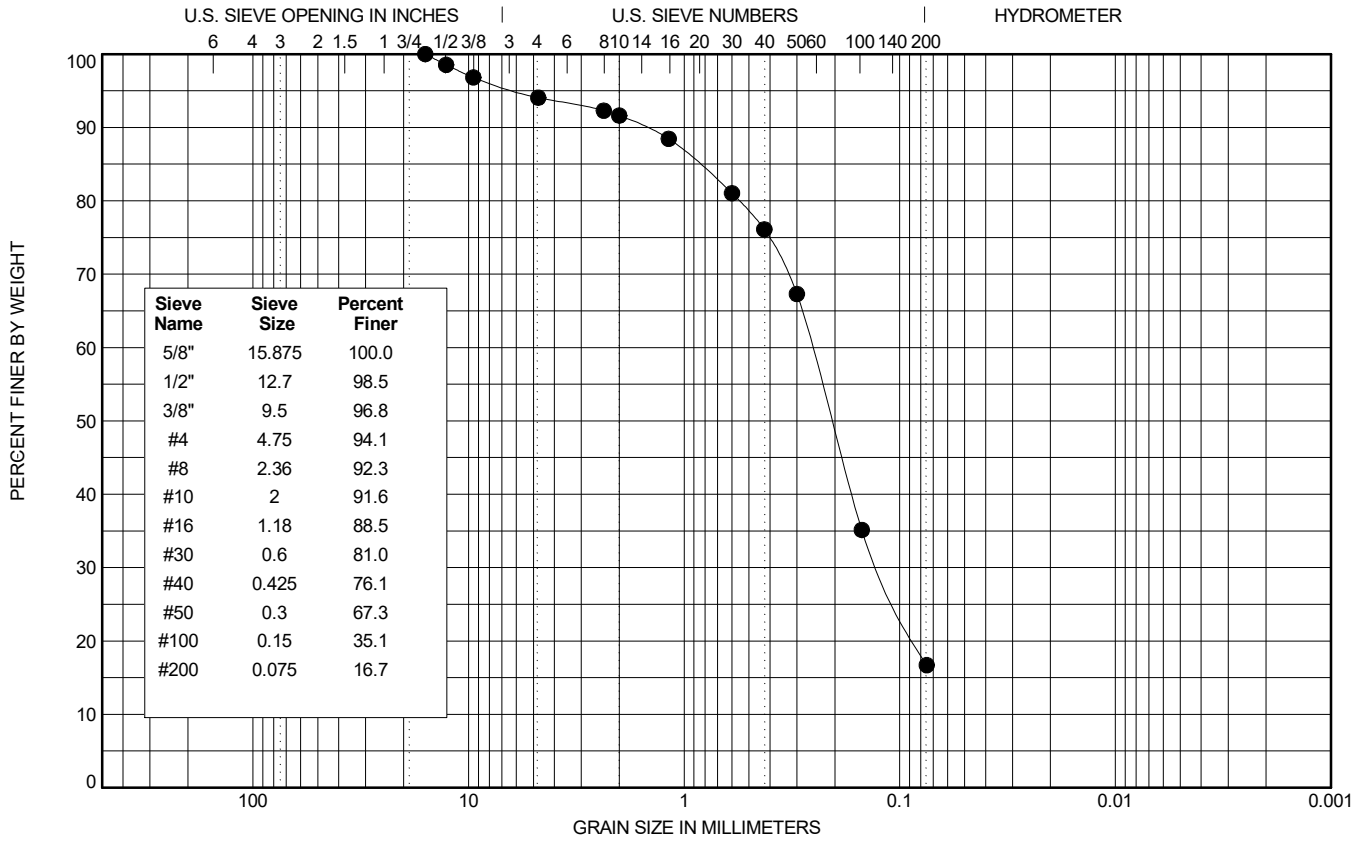
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-12	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		15.875	0.256	0.124		5.9	77.4	16.7	



Sieve Name	Sieve Size	Percent Finer
5/8"	15.875	100.0
1/2"	12.7	98.5
3/8"	9.5	96.8
#4	4.75	94.1
#8	2.36	92.3
#10	2	91.6
#16	1.18	88.5
#30	0.6	81.0
#40	0.425	76.1
#50	0.3	67.3
#100	0.15	35.1
#200	0.075	16.7

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

NORTHERN TECHNOLOGIES, LLC

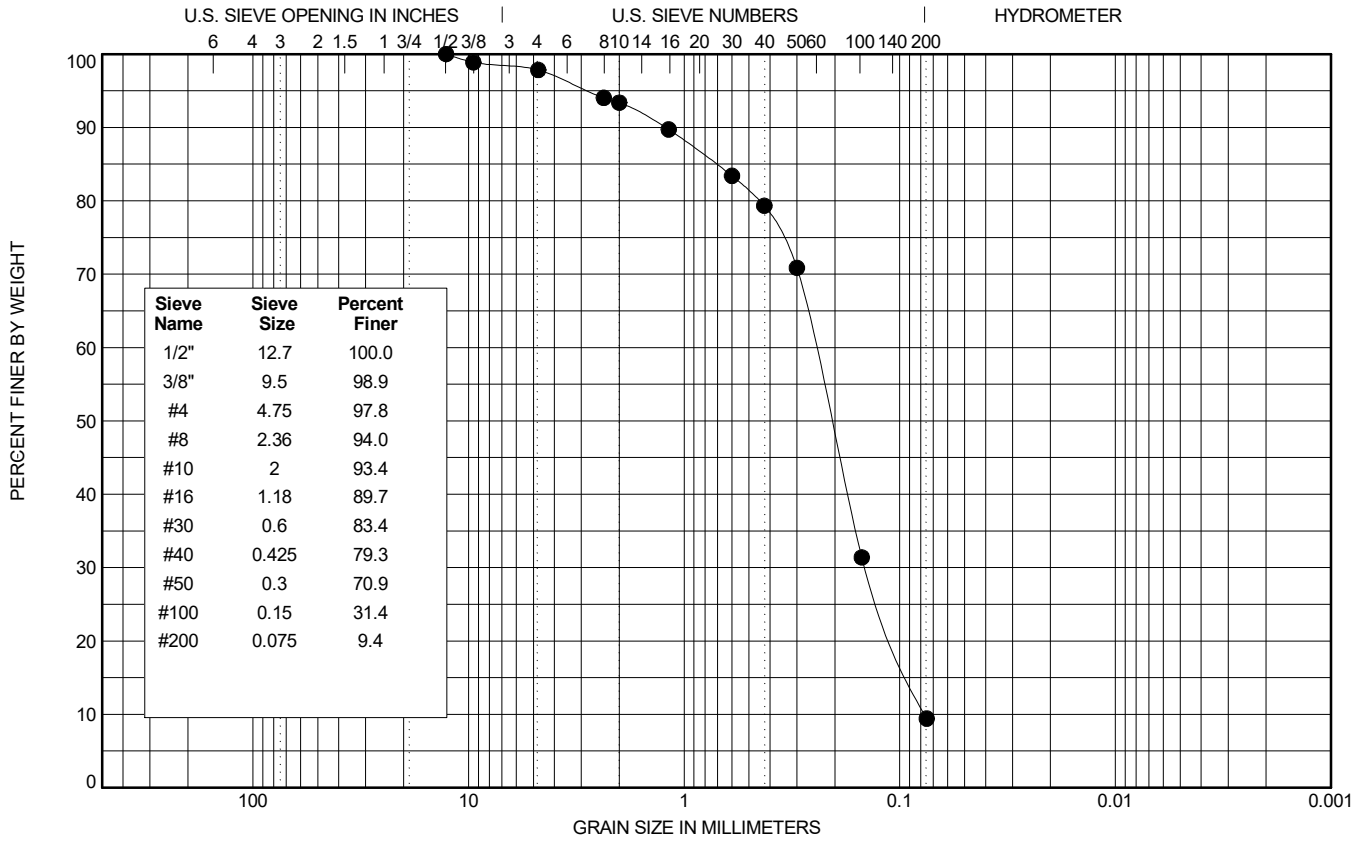
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-12	Date Sampled:	9/13/2018
Sample Number:	3	Sampled By:	NTI
Sample Depth:	4.5	Sample Type:	SS
Classification:	Well Graded Sand with Silt (SW-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
1.09	3.25	12.7	0.248	0.144	0.076	2.2	88.4	9.4	



Sieve Name	Sieve Size	Percent Finer
1/2"	12.7	100.0
3/8"	9.5	98.9
#4	4.75	97.8
#8	2.36	94.0
#10	2	93.4
#16	1.18	89.7
#30	0.6	83.4
#40	0.425	79.3
#50	0.3	70.9
#100	0.15	31.4
#200	0.075	9.4

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

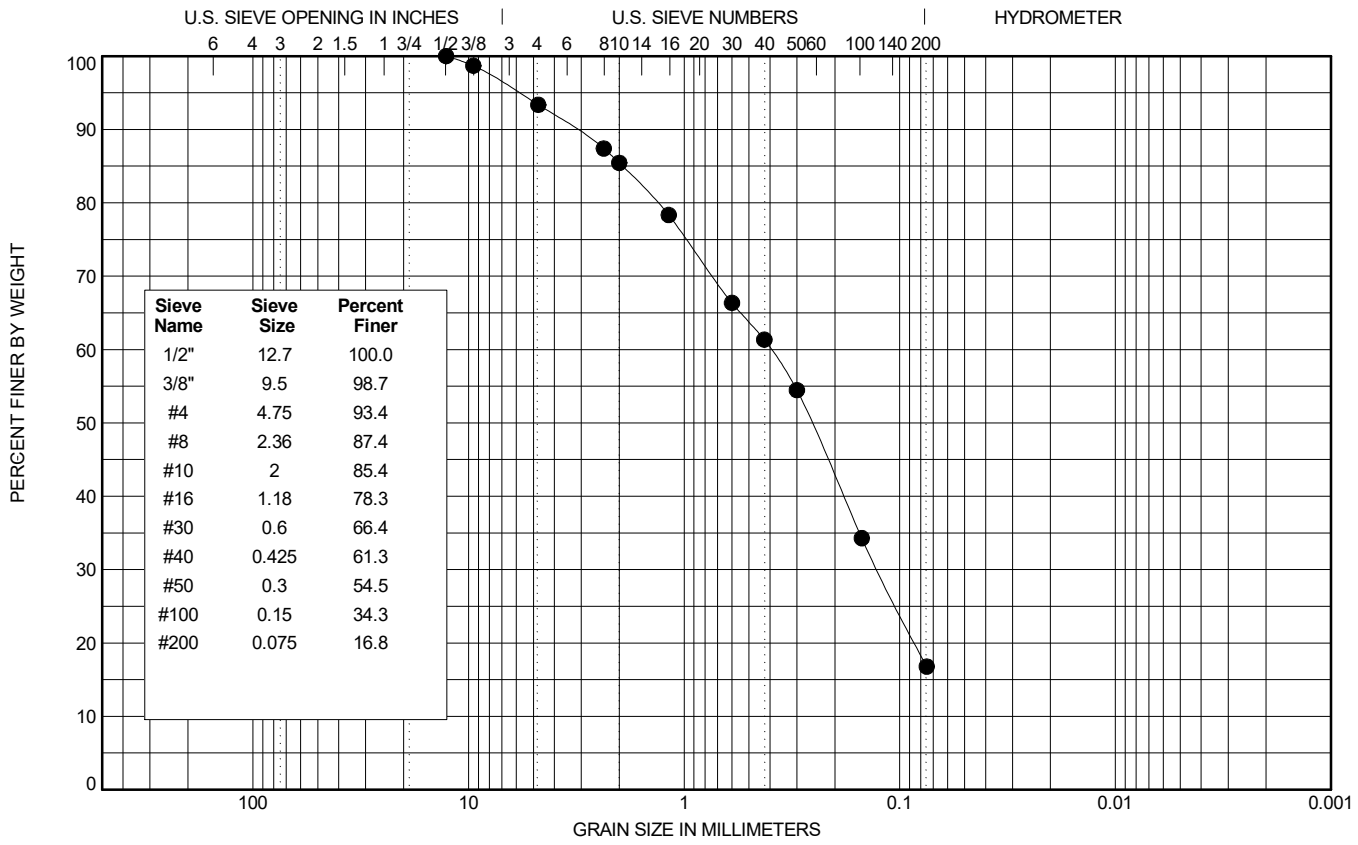
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-12	Date Sampled:	9/13/2018
Sample Number:	4	Sampled By:	NTI
Sample Depth:	7	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		12.7	0.397	0.127		6.6	76.6	16.8	



Sieve Name	Sieve Size	Percent Finer
1/2"	12.7	100.0
3/8"	9.5	98.7
#4	4.75	93.4
#8	2.36	87.4
#10	2	85.4
#16	1.18	78.3
#30	0.6	66.4
#40	0.425	61.3
#50	0.3	54.5
#100	0.15	34.3
#200	0.075	16.8

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

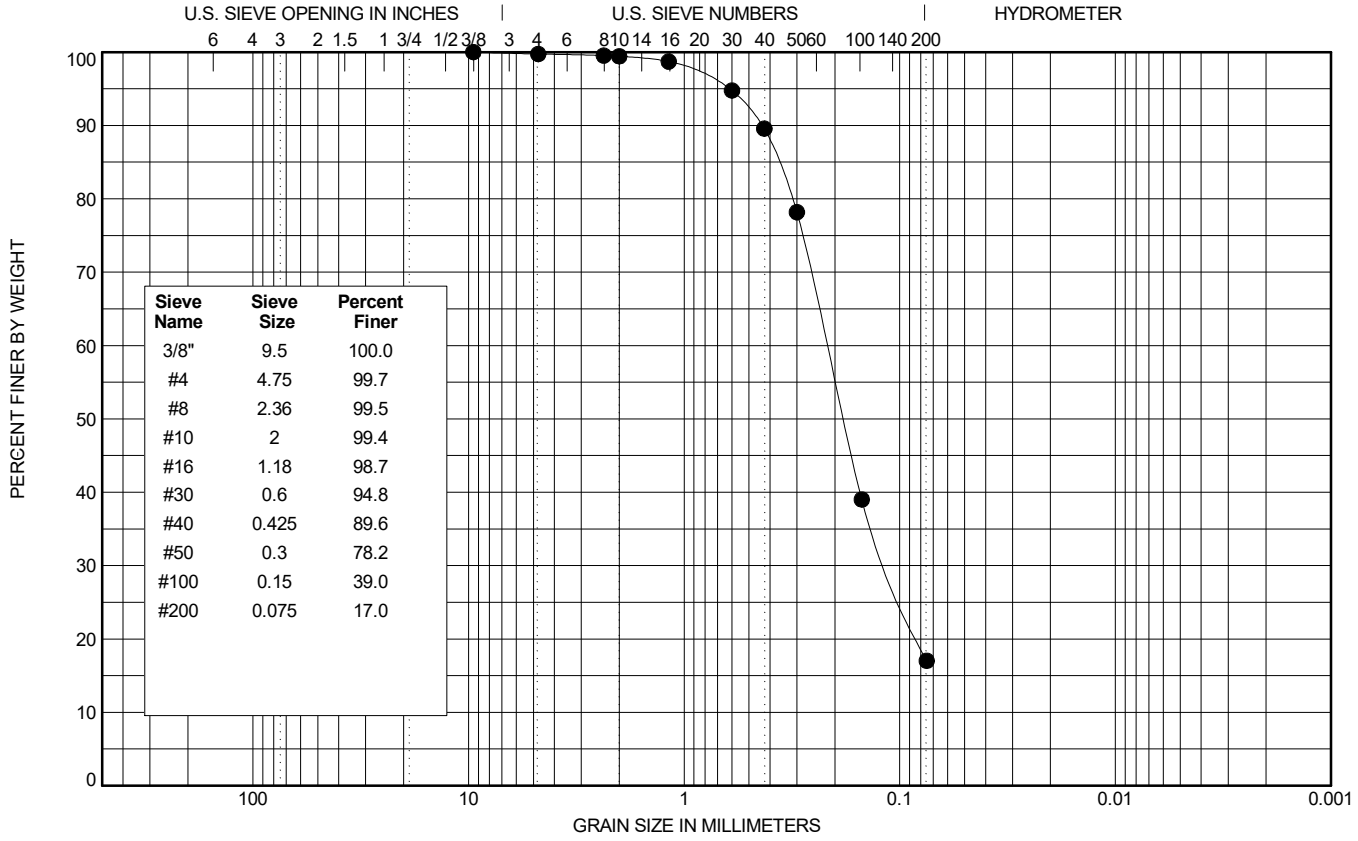
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-13	Date Sampled:	10/8/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		9.5	0.217	0.113		0.3	82.7	17.0	



Sieve Name	Sieve Size	Percent Finer
3/8"	9.5	100.0
#4	4.75	99.7
#8	2.36	99.5
#10	2	99.4
#16	1.18	98.7
#30	0.6	94.8
#40	0.425	89.6
#50	0.3	78.2
#100	0.15	39.0
#200	0.075	17.0

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

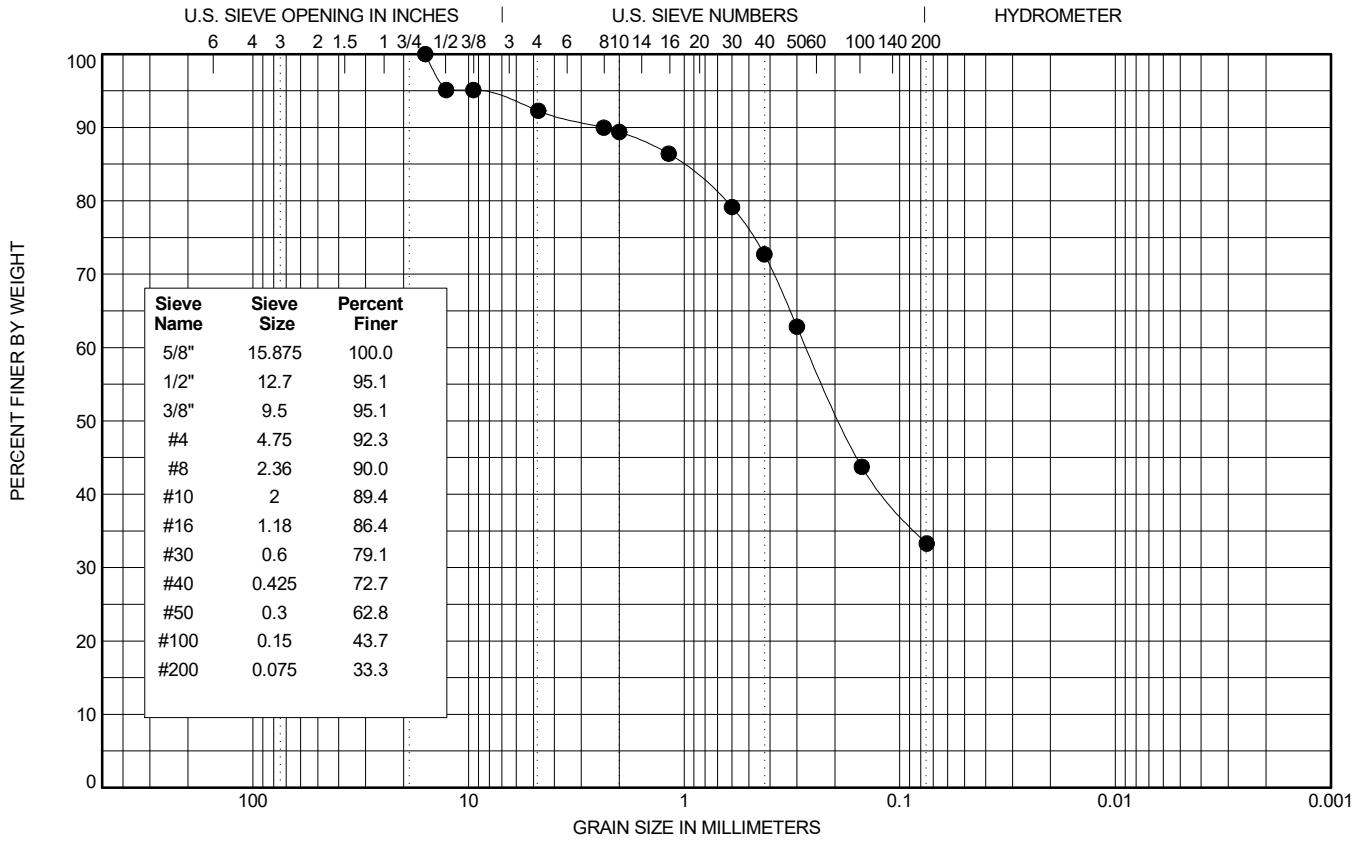
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-13	Date Sampled:	10/8/2018
Sample Number:	4	Sampled By:	NTI
Sample Depth:	7	Sample Type:	SS
Classification:	Clayey Sand (SC)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		15.875	0.271			7.7	59.0	33.3	



Sieve Name	Sieve Size	Percent Finer
5/8"	15.875	100.0
1/2"	12.7	95.1
3/8"	9.5	95.1
#4	4.75	92.3
#8	2.36	90.0
#10	2	89.4
#16	1.18	86.4
#30	0.6	79.1
#40	0.425	72.7
#50	0.3	62.8
#100	0.15	43.7
#200	0.075	33.3

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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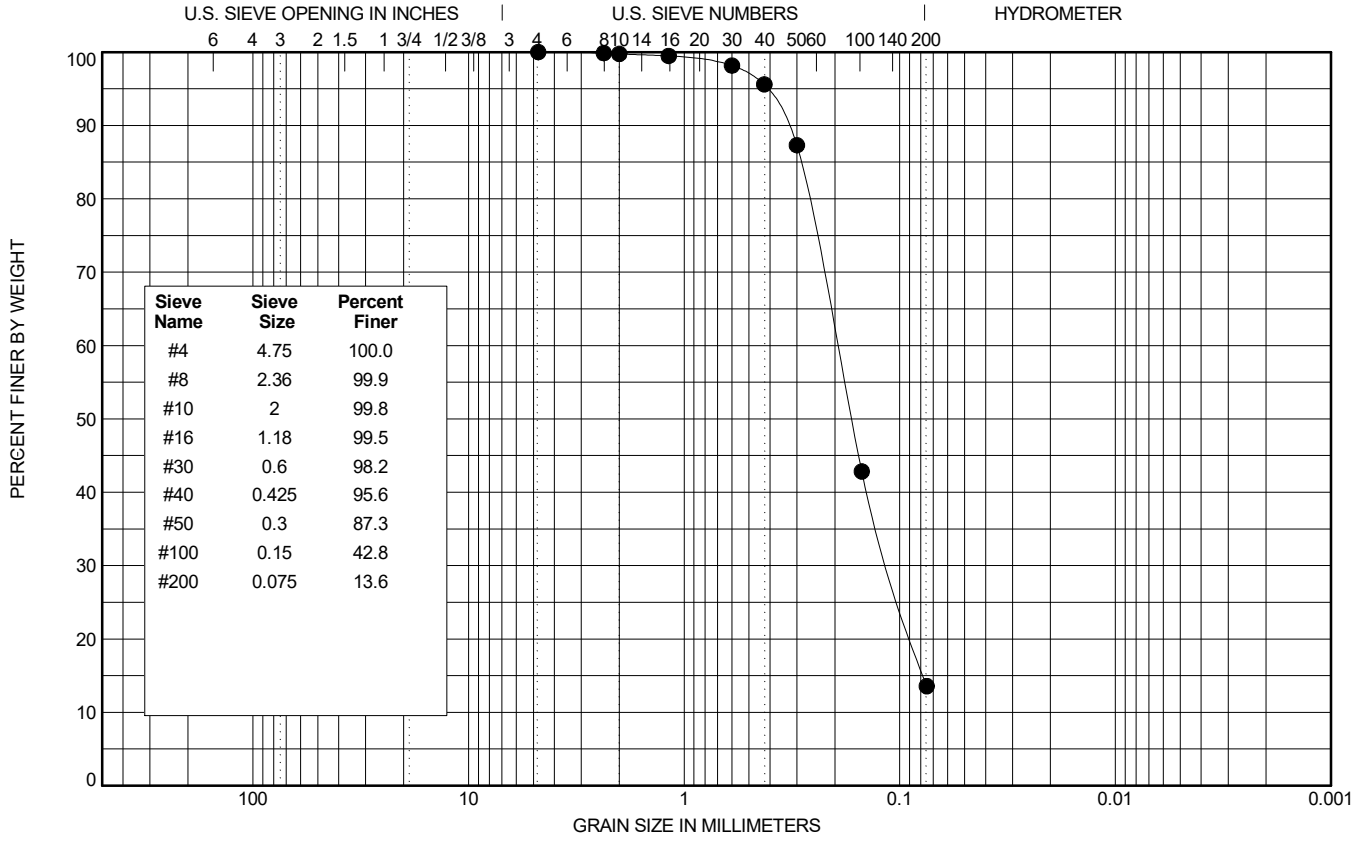
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-16	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		4.75	0.196	0.111		0.0	86.4	13.6	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	99.9
#10	2	99.8
#16	1.18	99.5
#30	0.6	98.2
#40	0.425	95.6
#50	0.3	87.3
#100	0.15	42.8
#200	0.075	13.6

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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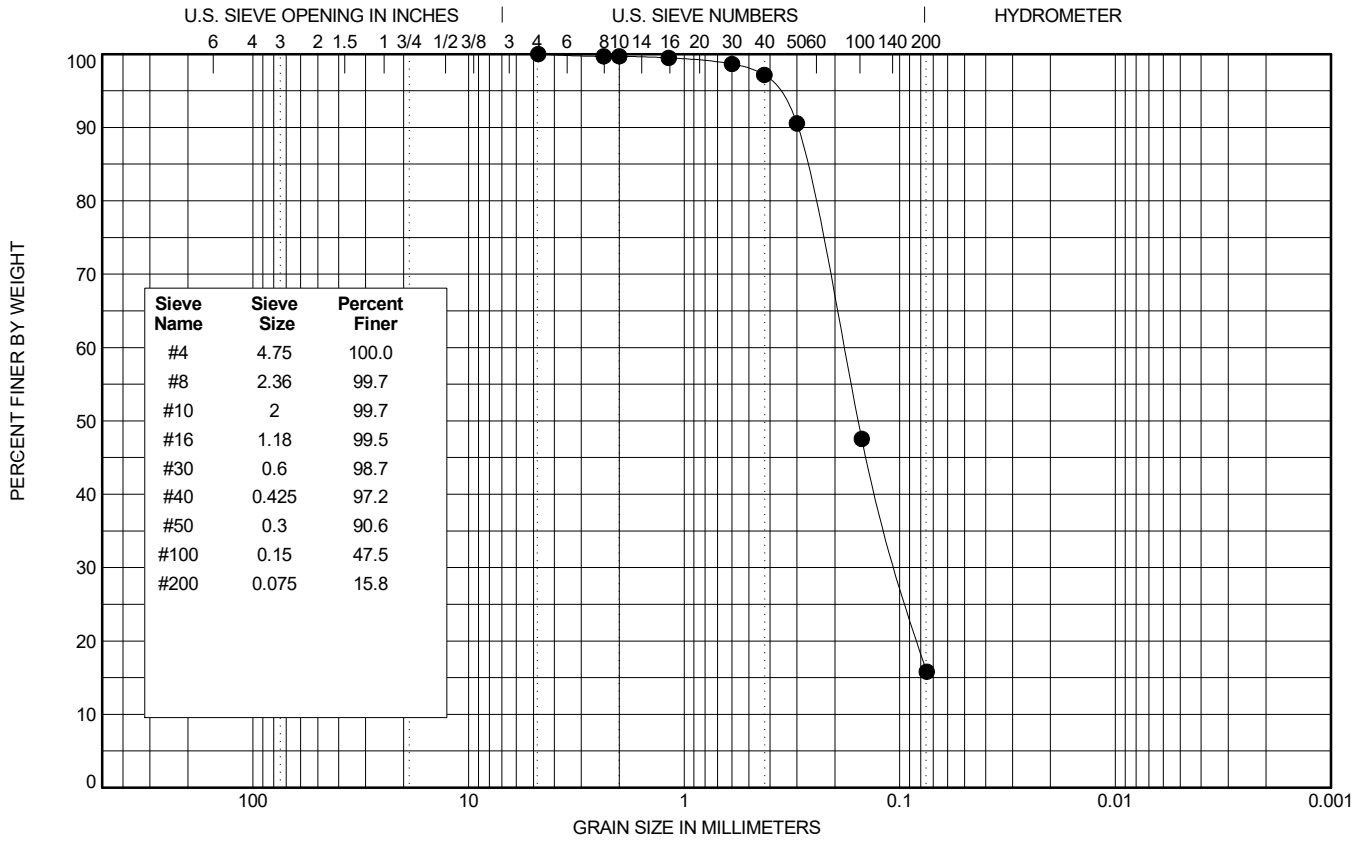
Attention:			

Sample Information

Boring Number:	SB-16	Date Sampled:	9/13/2018
Sample Number:	4	Sampled By:	NTI
Sample Depth:	7	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		4.75	0.183	0.102		0.0	84.2	15.8	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	99.7
#10	2	99.7
#16	1.18	99.5
#30	0.6	98.7
#40	0.425	97.2
#50	0.3	90.6
#100	0.15	47.5
#200	0.075	15.8

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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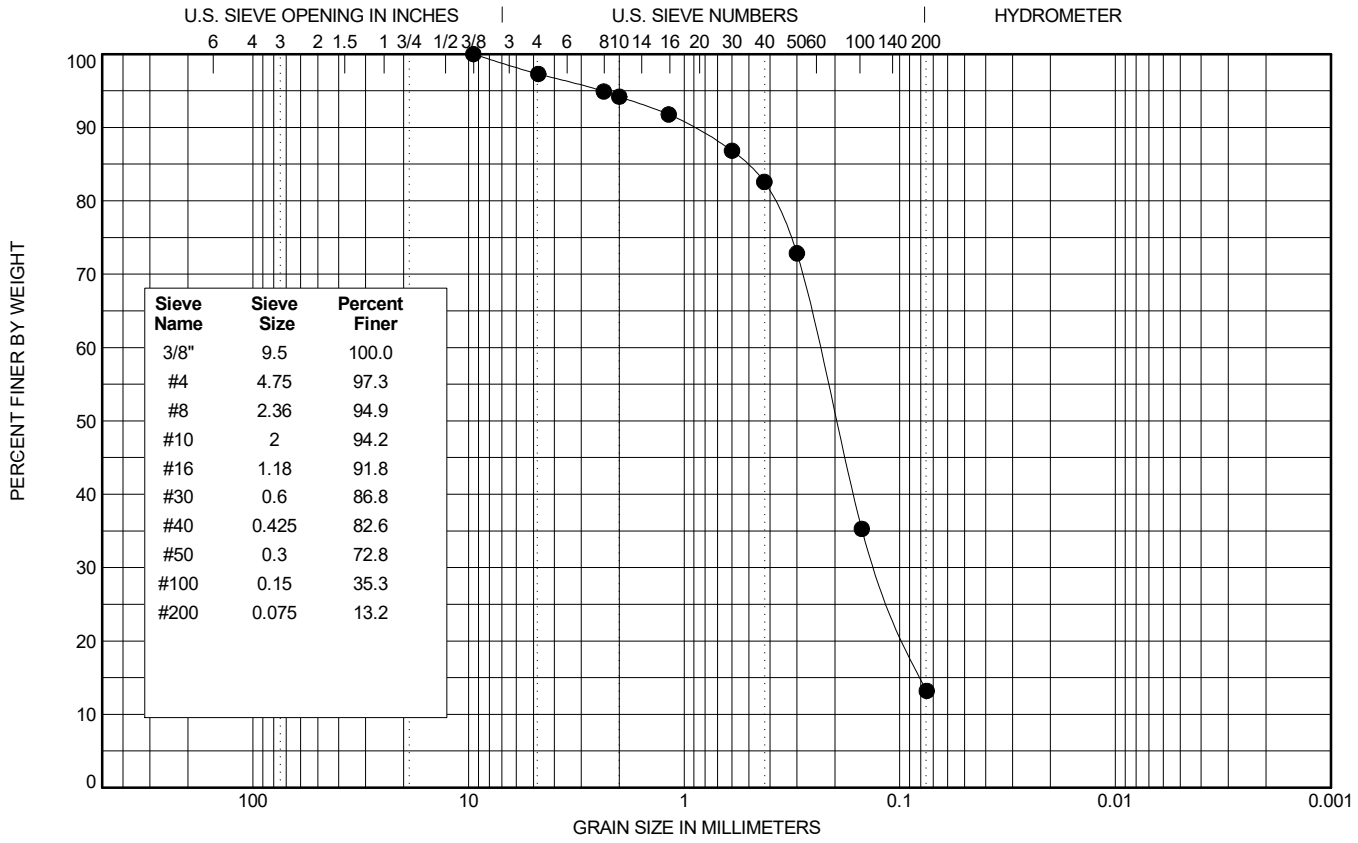
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-17	Date Sampled:	10/8/2018
Sample Number:	3	Sampled By:	NTI
Sample Depth:	4.5	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		9.5	0.237	0.127		2.7	84.1	13.2	



Sieve Name	Sieve Size	Percent Finer
3/8"	9.5	100.0
#4	4.75	97.3
#8	2.36	94.9
#10	2	94.2
#16	1.18	91.8
#30	0.6	86.8
#40	0.425	82.6
#50	0.3	72.8
#100	0.15	35.3
#200	0.075	13.2

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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GRAIN SIZE DISTRIBUTION

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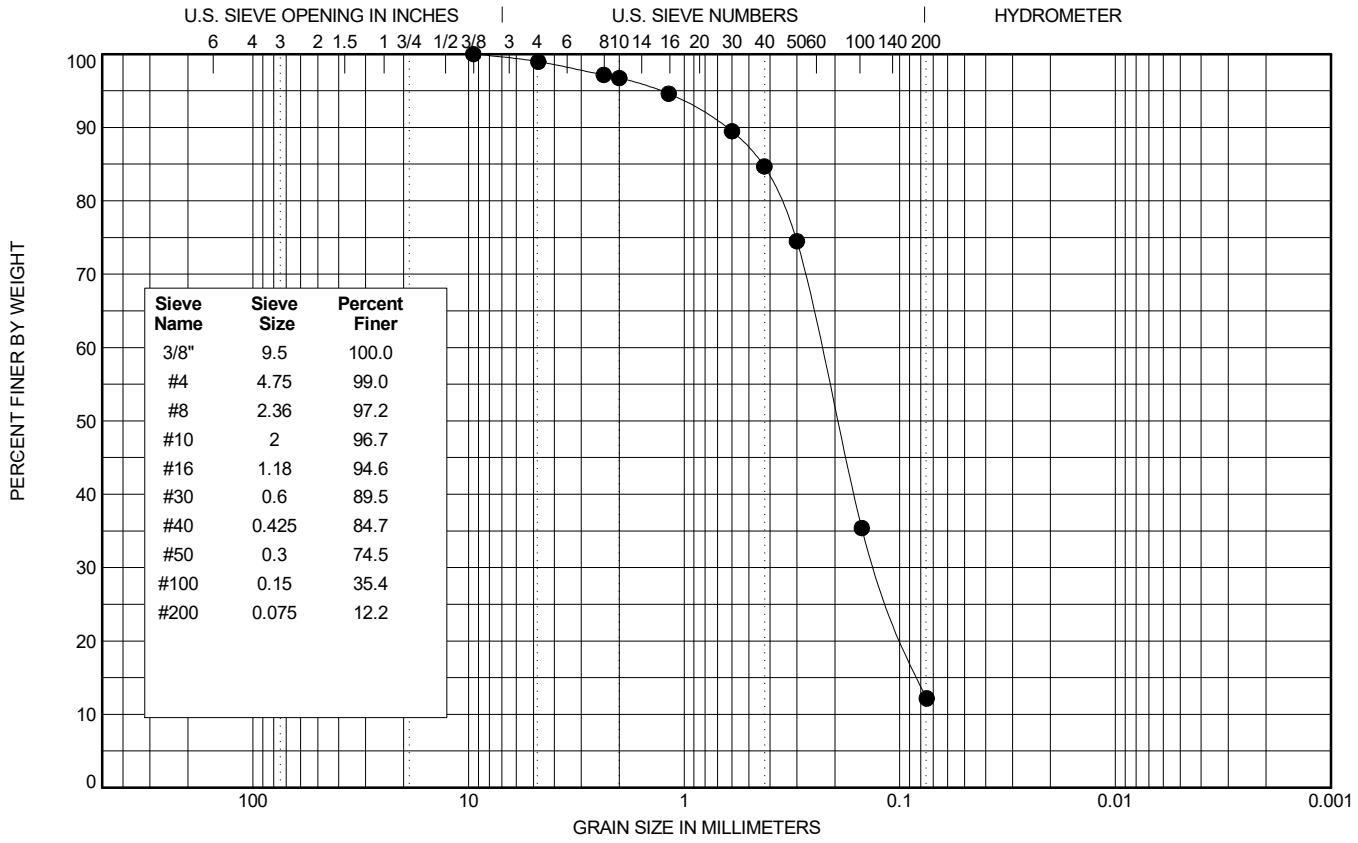
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-20	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
1.00	3.30	9.5	0.232	0.128		1.0	86.8	12.2	



Sieve Name	Sieve Size	Percent Finer
3/8"	9.5	100.0
#4	4.75	99.0
#8	2.36	97.2
#10	2	96.7
#16	1.18	94.6
#30	0.6	89.5
#40	0.425	84.7
#50	0.3	74.5
#100	0.15	35.4
#200	0.075	12.2

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

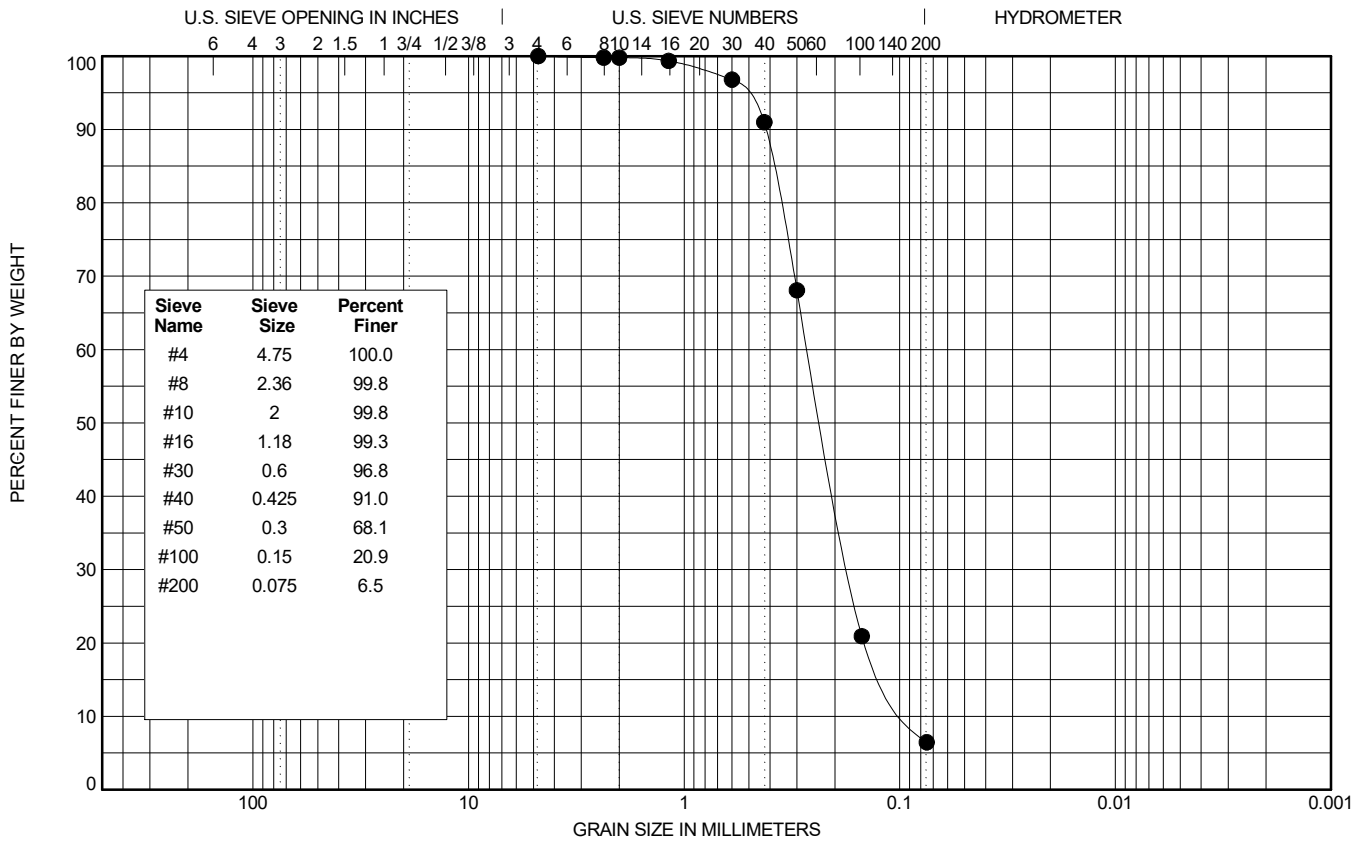
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-21	Date Sampled:	9/12/2018
Sample Number:	3	Sampled By:	NTI
Sample Depth:	4.5	Sample Type:	SS
Classification:	Well Graded Sand with Silt (SW-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
1.24	3.00	4.75	0.266	0.171	0.089	0.0	93.5	6.5	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	99.8
#10	2	99.8
#16	1.18	99.3
#30	0.6	96.8
#40	0.425	91.0
#50	0.3	68.1
#100	0.15	20.9
#200	0.075	6.5

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

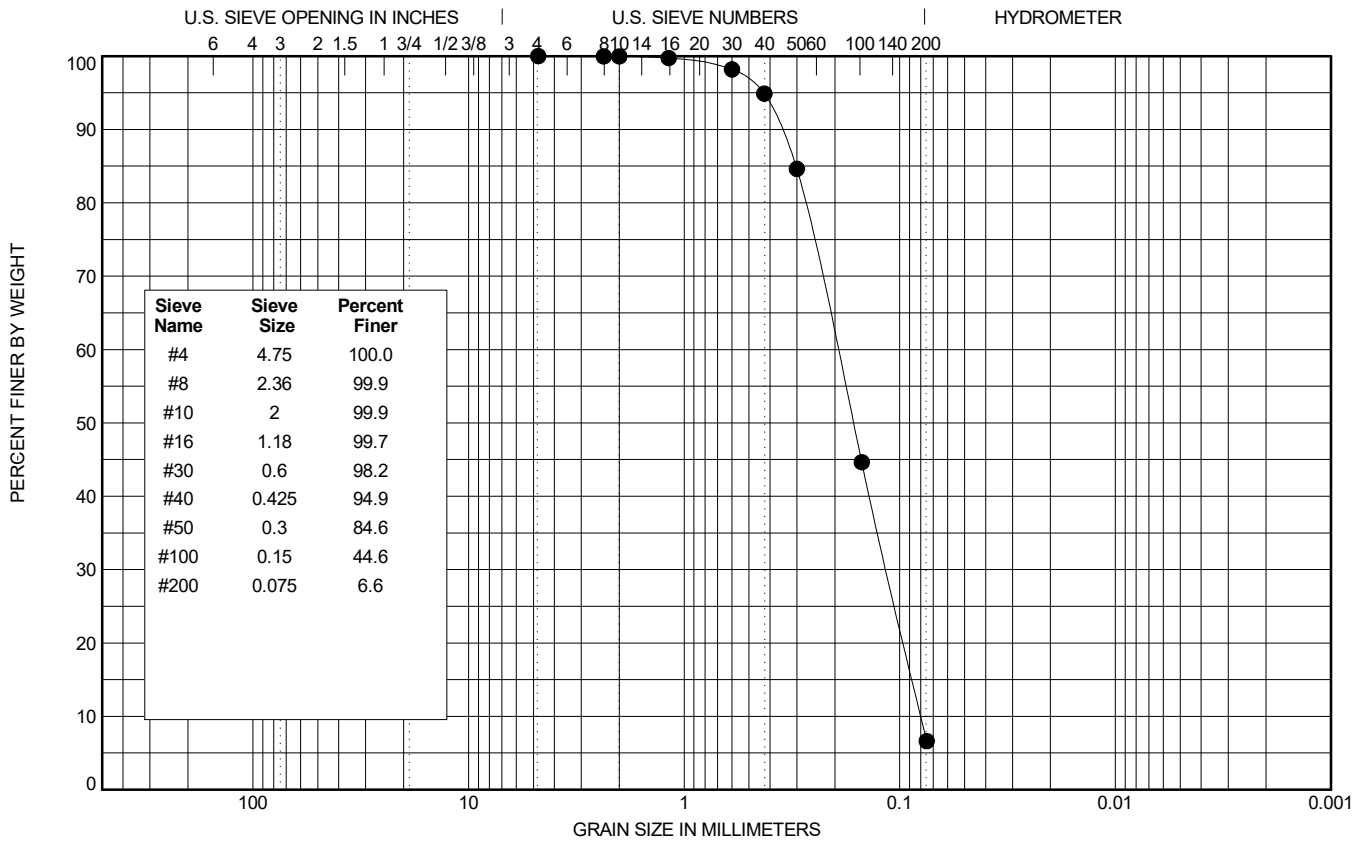
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-22	Date Sampled:	9/12/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Poorly Graded Sand with Silt (SP-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
0.84	2.45	4.75	0.196	0.115	0.08	0.0	93.4	6.6	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	99.9
#10	2	99.9
#16	1.18	99.7
#30	0.6	98.2
#40	0.425	94.9
#50	0.3	84.6
#100	0.15	44.6
#200	0.075	6.6

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

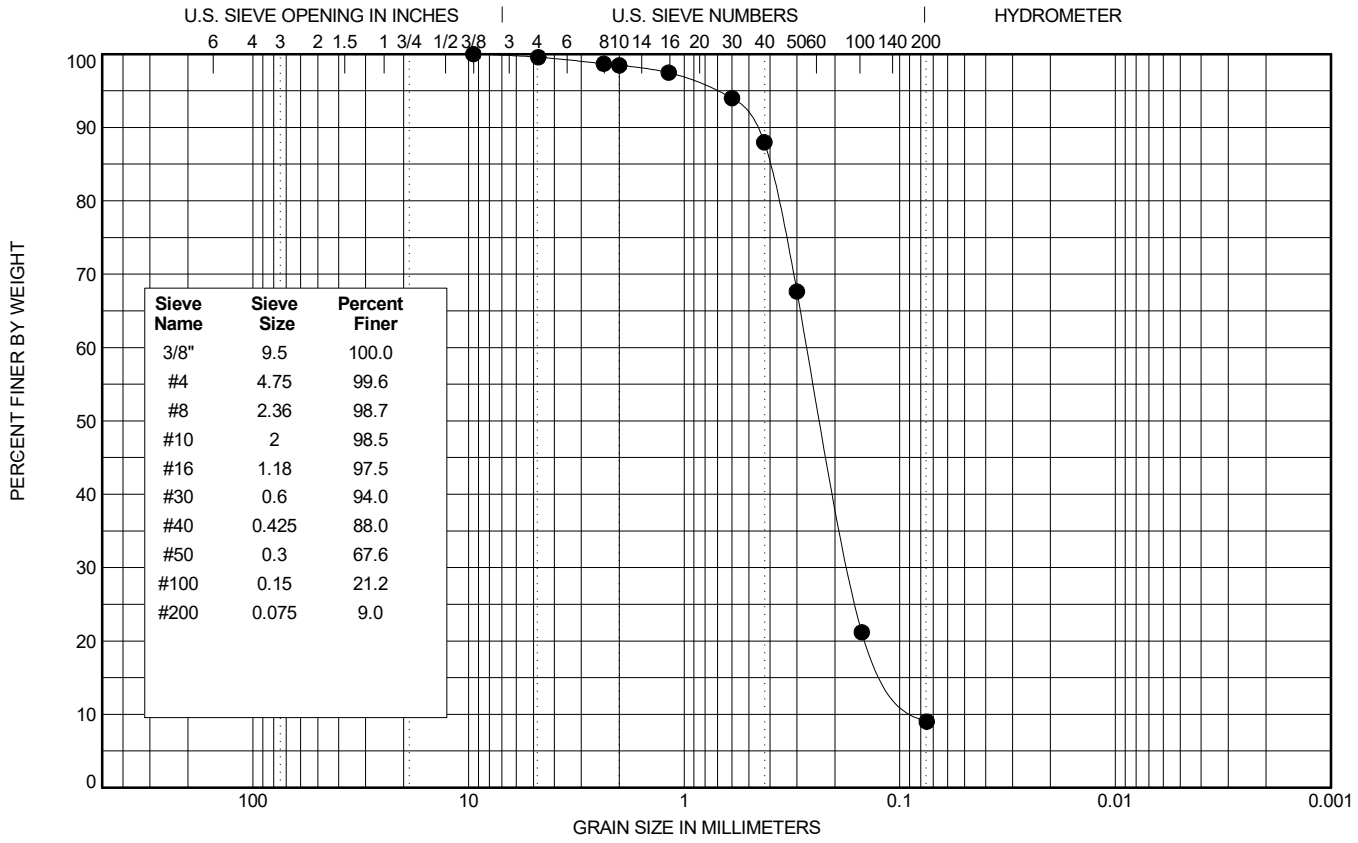
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-23	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Well Graded Sand with Silt (SW-SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
1.38	3.37	9.5	0.268	0.171	0.079	0.4	90.6	9.0	



Sieve Name	Sieve Size	Percent Finer
3/8"	9.5	100.0
#4	4.75	99.6
#8	2.36	98.7
#10	2	98.5
#16	1.18	97.5
#30	0.6	94.0
#40	0.425	88.0
#50	0.3	67.6
#100	0.15	21.2
#200	0.075	9.0

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

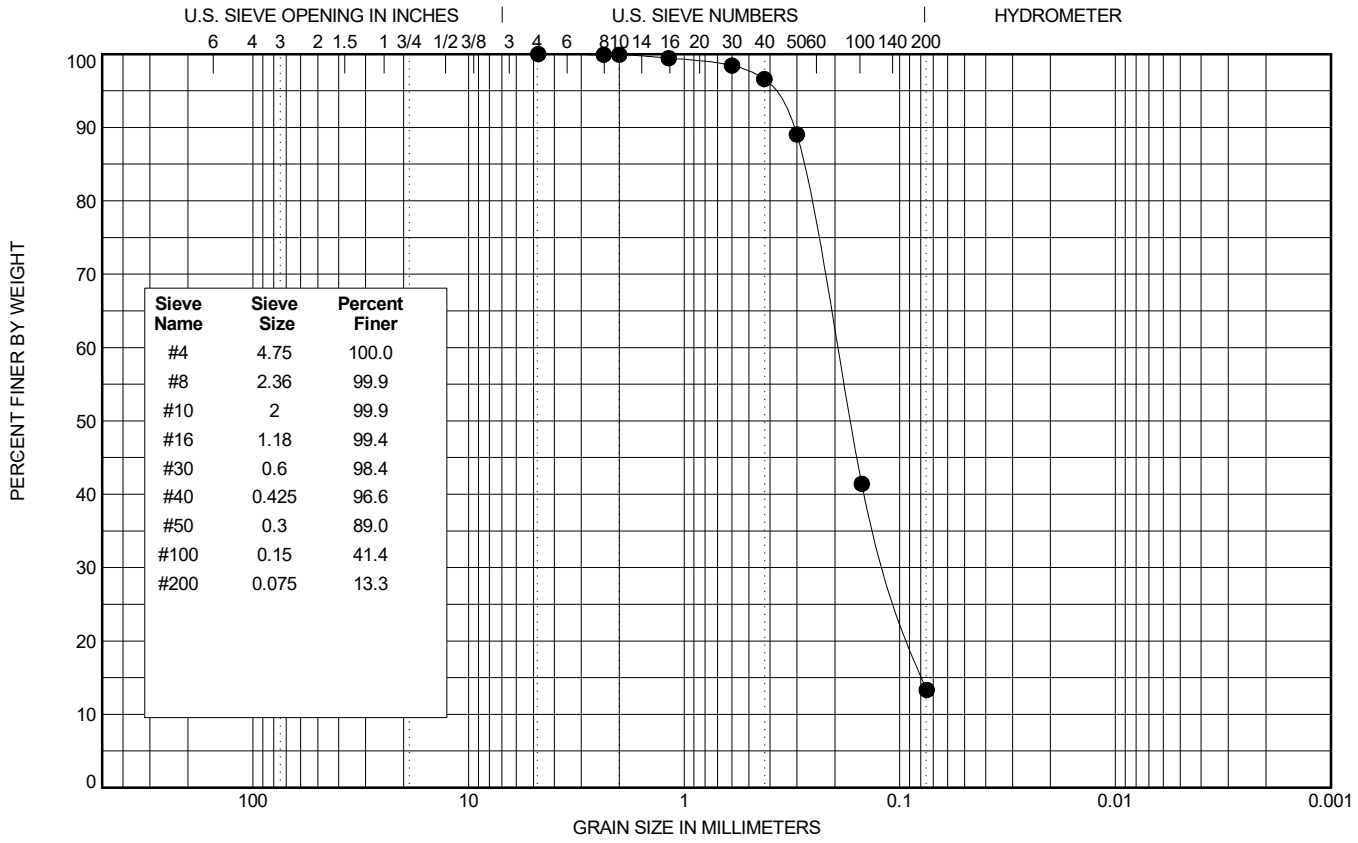
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-24	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		4.75	0.197	0.113		0.0	86.7	13.3	



Sieve Name	Sieve Size	Percent Finer
#4	4.75	100.0
#8	2.36	99.9
#10	2	99.9
#16	1.18	99.4
#30	0.6	98.4
#40	0.425	96.6
#50	0.3	89.0
#100	0.15	41.4
#200	0.075	13.3

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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GRAIN SIZE DISTRIBUTION

ASTM C136 & D422

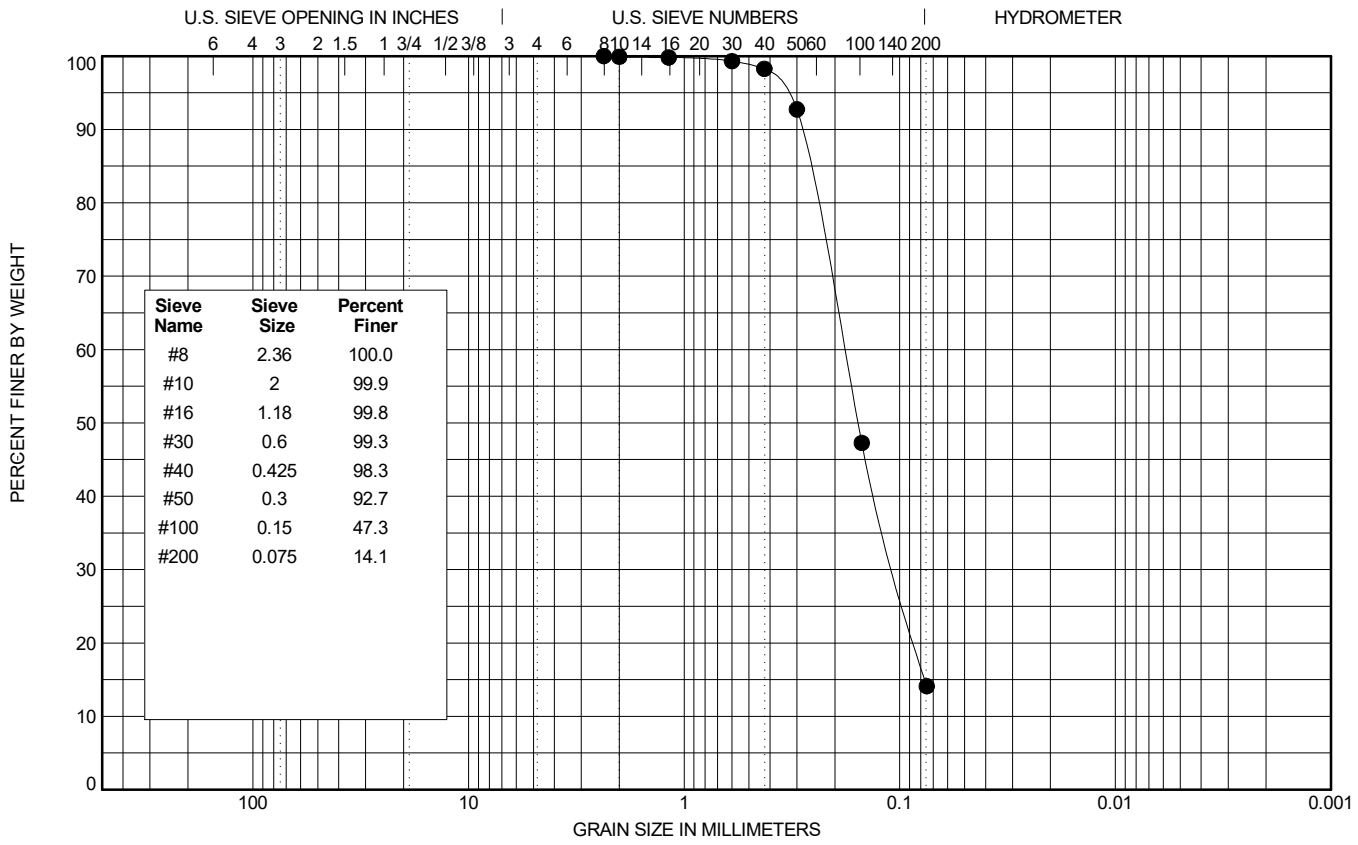
Report To:	SEH, Inc 3535 Vadnais Center Drive St. Paul MN 55110	Project: Project Number: Location:	North Owasso Boulevard 18.MSP06851.000 Shoreview, MN
Attention:			

Sample Information

Boring Number:	SB-25	Date Sampled:	9/13/2018
Sample Number:	2	Sampled By:	NTI
Sample Depth:	2	Sample Type:	SS
Classification:	Silty Sand (SM)		

Sample Data

Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
		2.36	0.182	0.105		0.0	85.9	14.1	



Sieve Name	Sieve Size	Percent Finer
#8	2.36	100.0
#10	2	99.9
#16	1.18	99.8
#30	0.6	99.3
#40	0.425	98.3
#50	0.3	92.7
#100	0.15	47.3
#200	0.075	14.1

Comments:

Cc:

Submitted by,

Northern Technologies, LLC

(11/3/18)

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N
RICE STREET
SOO LINE RR
SOO STREET
CHANDLER RD
KENT STREET
N OWASSO BLVD
OWASSO HEIGHTS RD
DALE STREET
OWASSO BLVD N
OWASSO STREET
EMMERT STREET
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