



## **REVISED REPORT OF GEOTECHNICAL EXPLORATION**

New Nicollet Redevelopment  
Nicollet Ave between Cecil Newman Ln  
and Lake St  
Minneapolis, Minnesota

**AET Project No. P-0045582**

**Date: November 5, 2025**

### **Prepared for:**

Minneapolis Department of Community Planning and  
Economic Development  
505 4th Avenue South, Suite 320  
Minneapolis, Minnesota 55415

Geotechnical • Materials  
Forensic • Environmental  
Building Technology  
Petrography/Chemistry

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November 5, 2025

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Attn: Linnea Graffunder-Bartels  
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RE: Revised Report of Geotechnical Exploration  
New Nicollet Redevelopment  
Nicollet Ave between Cecil Newman Ln and Lake St  
Minneapolis, Minnesota  
AET Report No. P-0045582

Dear Mrs. Graffunder-Bartels:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for your New Nicollet Redevelopment project in Minneapolis, Minnesota. These services were performed according to our proposal to you dated July 24, 2025.

We are submitting an electronic (pdf) copy of the report to you.

Please contact me if you have any questions about the report. I can also be contacted for arranging construction observation and testing services.

Sincerely,  
**American Engineering Testing, Inc.**

A handwritten signature in black ink, appearing to read 'R. Kaeppe', with a long, sweeping horizontal stroke extending to the right.

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**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 Minnesota Statute  
Section 326.02 to 326.15**

**Name: Reed Kaeppe**

**Date: November 5, 2025**

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# TABLE OF CONTENTS

|                                              | <u>Page</u> |
|----------------------------------------------|-------------|
| 1.0 INTRODUCTION .....                       | 1           |
| 2.0 SCOPE OF SERVICES .....                  | 1           |
| 3.0 PROJECT INFORMATION .....                | 1           |
| 4.0 SUBSURFACE EXPLORATION AND TESTING ..... | 2           |
| 4.1 Field Exploration Program .....          | 2           |
| 4.2 Laboratory Testing .....                 | 2           |
| 5.0 SITE CONDITIONS .....                    | 3           |
| 5.1 Surface Observations .....               | 3           |
| 5.2 Subsurface Soils/Geology .....           | 3           |
| 5.3 Groundwater .....                        | 3           |
| 5.4 Review of Soil Properties .....          | 3           |
| 6.0 RECOMMENDATIONS .....                    | 4           |
| 6.1 Discussion .....                         | 4           |
| 6.2 Excavation .....                         | 4           |
| 6.3 Fill Placement and Compaction .....      | 5           |
| 6.4 Foundations .....                        | 6           |
| 6.5 Floor Slab Design .....                  | 6           |
| 6.6 Exterior Building Backfill .....         | 7           |
| 6.7 Basement Backfill .....                  | 7           |
| 7.0 UTILITY RECOMMENDATIONS .....            | 8           |
| 7.1 Utility Installation Discussion .....    | 8           |
| 7.2 Utility Support .....                    | 9           |
| 7.3 Backfill and Compaction .....            | 9           |
| 8.0 CONSTRUCTION CONSIDERATIONS .....        | 9           |
| 8.1 Potential Difficulties .....             | 9           |
| 8.2 Excavation Backsloping .....             | 10          |
| 8.3 Observation and Testing .....            | 10          |
| 9.0 ASTM STANDARDS .....                     | 10          |
| 10.0 LIMITATIONS .....                       | 10          |

## TABLE OF CONTENTS - CONTINUED

### STANDARD SHEETS

- Floor Slab Moisture/Vapor Protection
- Freezing Weather Effects on Building Construction
- Basement Wall Backfill and Water Control

### APPENDIX A – Geotechnical Field Exploration and Testing

- Boring Log Notes
- Unified Soil Classification System
- Figure 1 – Boring Locations
- Subsurface Boring Logs
- Gradation Curves

### APPENDIX B – Geotechnical Report Limitations and Guidelines for Use

## 1.0 INTRODUCTION

The Minneapolis Department of Economic Planning and Development envisions two new apartment buildings in Minneapolis, Minnesota, according to the New Nicollet Development Framework approved by the Mayor and City Council in May 2025. To assist planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site, conduct soil laboratory testing, and perform a geotechnical engineering review for the project. This report presents the results of the above services and provides our engineering recommendations based on this data.

## 2.0 SCOPE OF SERVICES

AET's services were performed according to our proposal to you dated July 24, 2025, which you authorized on August 4, 2025. The authorized scope consists of the following.

- Drilling 10 Standard Penetration Test (SPT) borings including the following:
  - 4 SPT borings to a depth of 35 feet within the proposed building areas.
  - 4 SPT borings to a depth of 20 feet within the proposed building areas.
  - 2 SPT borings to a depth of 5 feet within the proposed public park.
- Performing requested soil laboratory testing.
- Geotechnical engineering review based on the data and preparation of this report.

These services are intended for geotechnical purposes only. AET also performed a Phase I Environmental Site Assessment (ESA) and a Phase II ESA. Our findings and recommendations will be submitted under separate covers.

## 3.0 PROJECT INFORMATION

We understand the Minneapolis Department of Economic Planning and Development is proposing the reconstruction of Nicollet Ave between the bridge over the Midtown Greenway and Lake St in Minneapolis, Minnesota, as well as several residential and mixed use structures on the east side of the reconstructed Nicollet Avenue. Future development on the west side of Nicollet Avenue was not included in this project scope. The proposed facilities consist of a public park, one 5 story residential structure, one 4 story residential structure, constructing Nicollet Avenue, concrete paved sidewalks, and patio spaces. We understand the structures will have one story of below grade parking. Additionally, we understand that the first two stories in each of the structures will be comprised of precast panels, while the remaining stories will consist of wood framing.

Our foundation design assumptions include a minimum factor of safety of 3 with respect to the ultimate bearing capacity. We assume the structures each will be able to tolerate total settlements of up to 1 inch, and differential settlements over a 30-foot distance of up to ½ inch.

The above stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

## 4.0 SUBSURFACE EXPLORATION AND TESTING

### 4.1 Field Exploration Program

The subsurface exploration program conducted for the project consisted of 10 standard penetration test borings performed on September 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup>. AET determined the number, depth, and locations of the soil borings.

The borings were located in the field by AET personnel using a GPS unit with sub-meter accuracy. Surface elevations were estimated using publicly available topographic data furnished by MnTOPO (<http://arcgis.dnr.state.mn.us/maps/mntopo/>). The ground surface elevations at the drilled locations are shown on top of the boring logs. The ground surface elevations shown on the logs are approximate and should not be used for the project design or construction.

The logs of the borings and details of the methods used appear in Appendix A. The logs contain information concerning soil layering, soil classification, geologic origins, and moisture condition. A density description or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

### 4.2 Laboratory Testing

The laboratory test program included visual/manual classification of the soil samples, water content tests, sieve analyses, and percent passing the #200 sieves. The moisture contents and percent passing the #200 sieve values are shown on the subsurface boring logs adjacent to the samples upon which they were performed. The full gradation curves are attached in the appendix following the boring logs.

## 5.0 SITE CONDITIONS

### 5.1 Surface Observations

The proposed development is located south of the intersection of Nicollet Ave and the Midtown Greenway in Minneapolis, Minnesota. The lot is developed with bituminous pavements associated with a previously demolished structure. The elevation on site is relatively flat. The surface elevations at the boring locations ranged from 881 feet at Boring B-6 to 885 feet at Boring B-9.

### 5.2 Subsurface Soils/Geology

The site geology consists of fill soils to depths of up to 14½ feet underlain by coarse alluvium to the termination depths of the borings at 6 to 36½ feet below grade. The fill soils consist of sandy lean clay, clayey sands, silty sands, sands with silt, and sands.

The underlying coarse alluvium consists of loose to very dense sands with variable gravel content. The N-values in these soils ranged from 6 to 54 blows per foot. Please refer to the boring logs for additional information.

### 5.3 Groundwater

Groundwater was not measured or observed in any of the borings. In the borings, the encountered soils were predominantly fast draining sandy coarse alluvial soils. In these soils, it may take hours for a water level to develop and reach equilibrium in an open borehole. Therefore, groundwater may be encountered at different depths than in our borings, or in areas beyond the extent of our exploration.

More accurate groundwater levels can be obtained by installing and monitoring piezometers; however, this was not part of our work scope. Groundwater levels do not remain static and fluctuate due to varying seasonal conditions and annual rainfall and snow melt amounts, as well as other factors.

### 5.4 Review of Soil Properties

#### 5.4.1 Fill or Possible Fill

In our opinion, the fill soils are low strength materials and are judged to be potentially compressible under structure loads or where grades are raised. The fill is generally judged to be moderately fast draining and has moderate frost susceptibility.

### 5.4.3 Coarse Alluvium

The coarse alluvial soils are judged to have moderately high to high strength and low compressibility. They are fast draining and have moderately to low frost susceptibility when they are impacted by freezing temperatures.

## 6.0 RECOMMENDATIONS

### 6.1 Discussion

Fill and possible fill soils were encountered to depths of up to 14½ feet below grade at our boring locations; however, fill soil depths can and will vary between boring locations. The N-values of the fill soils ranged from 4 to 39, indicating an extremely variable soil layer. Additionally, debris and trace organics were encountered at several boring locations.

It is our opinion the existing fill soils should not be left in place to support the proposed structures. Relying on the existing fill soils could lead to unacceptable total and differential settlements. We recommend removing the existing fill to the naturally deposited coarse alluvial soils and placing engineered fill in compacted lifts to design foundation and/or slab elevations.

### 6.2 Excavation

To prepare the structures for foundation and floor slab support, we recommend complete excavation of the fill soils, thereby exposing the underlying alluvial sandy soils. This would result in excavation depths at the boring locations as shown in Table 6.2.

**Table 6.2 – Recommended Excavation Depths**

| Boring Number | Surface Elevation (ft) <sup>A</sup> | Excavation Depth (ft, below existing grade) <sup>B</sup> | Approximate Excavation Elevation (ft) <sup>B</sup> |
|---------------|-------------------------------------|----------------------------------------------------------|----------------------------------------------------|
| B-01          | 884                                 | 7-9                                                      | 877-875 <sup>C</sup>                               |
| B-02          | 882                                 | 7                                                        | 875                                                |
| B-03          | 885                                 | 4½                                                       | 880½                                               |
| B-04          | 882                                 | 7                                                        | 875                                                |
| B-05          | 883                                 | 4½                                                       | 878½                                               |
| B-06          | 881                                 | 3                                                        | 878                                                |
| B-07          | 884                                 | 12                                                       | 872                                                |
| B-08          | 884                                 | 14½                                                      | 869½                                               |

Notes: A -Rounded to the nearest tenth of a foot.

B – Rounded to the nearest ½ foot.

C – Soils classified as “Alluvium or Fill” should be observed at the time of construction to determine geologic origin. Deeper excavation depth/elevation applies if determined to be undocumented fill soil.

The estimated excavation depths in Table 6.2 are based on the soil conditions at the specific boring locations. These depths will need to be evaluated during construction. Because conditions will vary away from the boring locations, we recommend that AET geotechnical personnel observe and evaluate the competency of the soils in the excavation bottom prior to new fill or footing placement. If soft or wet soils are encountered at the base of the excavation, they should be subcut and replaced or moisture conditioned and recompacted.

If the excavation extends below foundation grade, the excavation bottom must be oversized laterally beyond the planned outside edges of the foundations to properly support the lateral loads exerted by that foundation. This excavation oversizing should equal the vertical depth of fill needed to re-attain foundation grade at that location (i.e., 1H:1V oversizing).

Prior to fill placement or foundation construction, the exposed sands in the excavation bottom should be surface compacted with a vibratory compactor. Surface compaction should involve at least 6 passes with a vibratory roller compactor having a minimum static weight of 10 tons. The compactor passes should be performed in perpendicular directions (e.g., 3 passes east-west and 3 passes north-south). After surface compaction has been performed, refilling to attain footing grade may begin.

Groundwater was not observed at or above termination depths within the borings. Therefore, we do not expect that groundwater will be encountered within the required building excavations. If groundwater is encountered within the excavations, it should be removed. Dewatering means and methods are the responsibility of the contractor.

### **6.3 Fill Placement and Compaction**

Within the apartment building footprints, the on-site, non-organic, debris-free soils can be used as structural backfill. It is beyond our scope of services to estimate the volume of soils that can be reused onsite. If additional fill is needed, it should consist of soils substantially matching the existing soils in moisture content and composition, such as sands with a total fines content (percent passing the #200 sieve) of less than 12%. If the contractor proposes a different type of fill, a sample should be submitted to the Geotechnical Engineer for approval.

Fill placed to attain grade for foundation support should be compacted in thin lifts, such that the entire lift achieves a minimum compaction level of 98% of the standard maximum dry unit weight per ASTM: D698 (Standard Proctor test). Fill soils should be moisture conditioned (e.g. wetted or dried) to within  $\pm 2\%$  of their optimum moisture content per the standard Proctor test.

All fill should be free of debris, rubble, organics, and other unsuitable materials. All fill soils should be compacted with equipment which will densify the entire lift of fill. Fill should not be placed over frozen soils, and frozen soils should not be used as fill.

If earthwork operations take place during freezing weather, all frozen soils, snow, and ice should be stripped from the areas to be filled prior to new fill placement. The new fill should not be allowed to freeze during transit, placement, or compaction. We refer you to the attached sheet entitled "Freezing Weather Effects on Building Construction" for additional information.

## **6.4 Foundations**

It is our opinion that the proposed apartment buildings can be supported on conventional spread footings following the above recommended earthwork. The new building foundations would be supported on the naturally-deposited alluvial silty sands or on the newly placed and compacted engineered fill. We recommend perimeter foundations for heated building spaces be placed such that the bottoms are a minimum of 42 inches below exterior grade. We recommend foundations for the unheated structures be extended to a minimum of 60 inches below exterior grade. For buildings with below grade basements, the foundations may be placed directly below the grade beams or basement walls.

Based on the conditions encountered, it is our opinion the building foundations can be designed based on a net maximum allowable soil bearing pressure of 4,000 psf. This refers to the pressure that may be transmitted to the bearing stratum in excess of the pressure from the surrounding depth of overburden. The footings should have a minimum width of 24 inches for strip footings and 36 inches for column footings to avoid disproportionally small footing sizes. It is our judgment this design pressure will have a factor of safety of at least 3 against the ultimate bearing capacity. We estimate that total settlements under this loading should not exceed 1 inch. We also estimate that differential settlements of conditions depicted by the borings should not exceed ½ inch.

The bottoms of all foundation excavations should be free of water and loose soil prior to placing structural fill or concrete. Structural fill should be placed soon after excavating to reduce bearing soil disturbance, and concrete should be placed soon after excavating or completion of the structural fill placement. If the materials at bearing level become excessively dry, disturbed, saturated, or frozen, the affected material should be removed and replaced prior to placing concrete.

## **6.5 Floor Slab Design**

All fill soils that are placed below on-grade floor slabs, including foundation backfill and in underslab utility trenches, should be compacted to at least 95% of the Standard Proctor

maximum dry density. The fill soils should be placed in loose lift thicknesses not exceeding ten inches to allow compaction of the entire layer with the equipment being used.

The on-grade slabs can be supported with the in-situ non-organic fill or alluvial soils. We recommend using a modulus of subgrade reaction (k-value) of 200 psi/inch for these soils. Alternatively, the floor slab can be supported on 6 inches of imported aggregate material, meeting the gradation requirements of MnDOT Class 5 (Table 3138.2-3). If a 6-inch thick layer of Class 5 is used, an increased modulus of 230 psi/inch can be used.

For recommendations pertaining to moisture and vapor protection of interior floor slabs, we refer you to the standard sheet entitled “Floor Slab Moisture/Vapor Protection” at the end of this report. A vapor retarder should be placed under the floor slab where there are moisture sensitive floor coverings/coatings.

## **6.6 Exterior Building Backfill**

Fill that is placed below sidewalks, stoops, and exterior slabs should be compacted to a minimum of 95% of the standard Proctor maximum dry density. In the upper 3 feet of pavement subgrades, compaction should be increased to 100%. Fill placed in landscaped areas should be compacted to a minimum of 90% of the standard Proctor maximum dry density.

For design considerations that could help mitigate problems related to frozen soil behavior we refer you to the attached sheet entitled “Freezing Weather Effects on Building Construction”.

## **6.7 Basement Backfill**

The walls associated with the basements will act as cantilever retaining walls. We recommend the walls be backfilled with free-draining sand having less than 5% passing the No. 200 sieve and no more than 40% of the particles (by weight) finer than the No. 40 sieve. The zone of sand backfill should extend outward from the wall at least 2 feet, and then upward and outward from the wall at a 30 degree or greater angle from vertical. The sand backfill should be placed in lifts and compacted with portable compaction equipment to at least 95% of the maximum Standard Proctor dry density (ASTM D698). For the sand backfill previously described, we recommend the following ultimate lateral earth pressure values (given in equivalent fluid pressure values), as well as other soil parameters be used in design of the retaining walls:

**Table 6.7 - Soil Parameters for Sand Backfill**

|                              |            |
|------------------------------|------------|
| Active Earth Pressure        | 35 psf/ft  |
| Passive Earth Pressure       | 410 psf/ft |
| At-rest Earth Pressure       | 60 psf/ft  |
| Internal Friction Angle      | 32 degrees |
| Sliding Friction Coefficient | 0.35       |
| Unit Weight                  | 125 pcf    |

Because movement is required to develop the full passive pressure, we recommend applying a factor of safety of at least 2 to the above passive value for design. The lateral earth pressures are not applicable for submerged soils/hydrostatic loading and do not include surcharge loading.

Compaction within 5 feet of the back of the walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures which could result in unexpected wall movement or cracking. Caution should be exercised about vibration effects on nearby structures from soil compaction activities. In highly vibration-sensitive areas, backfill with 3/8" minus pea rock, self-compacting, wrapped in fabric to prevent the migration of fines.

Please refer to the attached standard sheet entitled "Basement/Retaining Wall Backfill and Water Control" for additional information on our recommendations on backfilling basement walls.

## 7.0 UTILITY RECOMMENDATIONS

### 7.1 Utility Installation Discussion

The depths of the proposed utilities have not been provided. However, we assume they will be placed at depths of 12 feet or less. Based on the conditions encountered at the borings, these utilities will likely bear within the coarse alluvial sands.

Groundwater was not observed in any of the borings below grade. In the borings, the encountered soils were predominantly fast draining sandy coarse alluvial soils. In these soils, it may take hours for a water level to develop and reach equilibrium in an open borehole. Therefore, groundwater may be encountered at different depths than in our borings, or in areas beyond the extent of our exploration. Due to the relatively high permeability of the site soils, sump pumps may not be sufficient to dewater the site if active groundwater conditions are encountered during construction. Instead, more intricate dewatering methods, such as well points, may be needed. Dewatering means and methods should be determined by the construction team based on the conditions encountered during excavation.

## 7.2 Utility Support

Based on the conditions encountered at the boring locations, it is our opinion that the soils exposed in utility excavations at this site should generally be suitable for utility support. Gravel was observed within the alluvial layers at several boring locations. Therefore, we recommend providing a 4 to 6-inch thick layer of Granular Bedding (MnDOT Spec. 3149.2F) directly beneath the pipes, per the pipe manufacturers recommendations. The bedding should be shaped to conform to the bottom of the pipe to minimize point or imbalanced loads on the pipe and provide uniform pipe support.

If unstable soils are encountered and additional sub-cutting is necessary to provide pipe support, the excavation for pipe foundation improvement should be laterally oversized at the bottom a horizontal distance (from the outermost plan view point of the pipe) at least equal to the vertical distance between the lowest bottom elevation of the pipe and the lowest excavation bottom elevation (i.e., 1H:1V lateral oversize).

## 7.3 Backfill and Compaction

On-site, inorganic, soils may be suitable for reuse as utility backfill provided they can be properly moisture conditioned and compacted. The fill soils should be free of organic matter, rubble, debris, or gravel larger than 3 inches in the largest dimension. Utility trench backfill soils should match the adjacent subgrade soils when placed within 3 feet of grading grade.

Utility backfill soils should be placed in lift thicknesses appropriate to the compaction equipment being used and the soil being compacted. The compactor should be capable of compacting the entire lift thickness to the recommended compaction level. We recommend trench backfill placed within 3 feet of grading grade be compacted to a minimum of 100% of the Standard Proctor (ASTM D698) maximum dry unit weight. The remaining utility trench backfill below the upper 3 feet can have a minimum compaction level of 95% of the Standard Proctor maximum dry unit weight.

# 8.0 CONSTRUCTION CONSIDERATIONS

## 8.1 Potential Difficulties

### 8.1.1 Runoff Water in Excavation

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction.

### **8.1.2 Disturbance of Soils**

The on-site soils can be disturbed under construction traffic, especially if the soils are wet. If soils become disturbed, they should be subcut to the underlying undisturbed soils. The subcut soils can then be dried and recompact back into place, or they should be removed and replaced with drier imported fill.

### **8.1.3 Cobbles and Boulders**

The alluvium soils at this site can include cobbles and boulders. This may make excavating procedures somewhat more difficult than normal if they are encountered.

## **8.2 Excavation Backsloping**

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on [www.osha.gov](http://www.osha.gov)). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce side slope erosion or sloughing which could require slope maintenance.

## **8.3 Observation and Testing**

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed in order to document that project specifications for compaction have been satisfied.

## **9.0 ASTM STANDARDS**

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

## **10.0 LIMITATIONS**

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, express or implied, is intended.

Important information regarding risk management and proper use of this report is given in Appendix B entitled "Geotechnical Report Limitations and Guidelines for Use."

# Standard Sheets

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Freezing Weather Effects in Building  
Floor Slab Moisture Protection  
Basement Wall Backfill and Water Control

# Appendix A

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Geotechnical Field Exploration and Testing  
Boring Log Notes  
Unified Soil Classification System  
Figure 1 – Boring Locations  
Subsurface Boring Logs  
Gradation Curves

**Appendix A**  
**Geotechnical Field Exploration and Testing**  
**Report No. P-0045582**

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### **A.1 FIELD EXPLORATION**

The subsurface conditions at the site were explored by drilling and sampling 10 standard penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

### **A.2 SAMPLING METHODS**

#### **A.2.1 Split-Spoon Samples (SS)**

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value.

#### **A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)**

Sample types described as “DS” or “SU” on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

#### **A.2.3 Sampling Limitations**

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of “topsoil” layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

### **A.3 CLASSIFICATION METHODS**

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

### **A.4 WATER LEVEL MEASUREMENTS**

The groundwater level measurements are shown at the bottom of the boring logs. The following information appears under “Water Level Measurements” on the logs:

- ♦ Date and Time of measurement
- ♦ Sampled Depth: lowest depth of soil sampling at the time of measurement
- ♦ Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- ♦ Cave-in Depth: depth at which measuring tape stops in the borehole
- ♦ Water Level: depth in the borehole where free water is encountered
- ♦ Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

**Appendix A**  
**Geotechnical Field Exploration and Testing**  
**Report No. P-0045582**

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**A.5 LABORATORY TEST METHODS**

**A.5.1 Water Content Tests**

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

**A.5.2 Sieve Analysis of Soils (thru #200 Sieve)**

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method

**A.5.3 Percent Finer than #200 Sieve**

Conducted per AET Procedure 01-LAB-060, which is performed in general conformance with ASTM: D1140.

**A.6 TEST STANDARD LIMITATIONS**

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

**A.7 SAMPLE STORAGE**

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

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## **FREEZING WEATHER EFFECTS ON BUILDING CONSTRUCTION**

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### **GENERAL**

Because water expands upon freezing and soils contain water, soils which are allowed to freeze will heave and lose density. Upon thawing, these soils will not regain their original strength and density. The extent of heave and density/strength loss depends on the soil type and moisture condition. Heave is greater in soils with higher percentages of fines (silts/clays). High silt content soils are most susceptible, due to their high capillary rise potential which can create ice lenses. Fine grained soils generally heave about 1/4" to 3/8" for each foot of frost penetration. This can translate to 1" to 2" of total frost heave. This total amount can be significantly greater if ice lensing occurs.

### **DESIGN CONSIDERATIONS**

Clayey and silty soils can be used as perimeter backfill, although the effect of their poor drainage and frost properties should be considered. Basement areas will have special drainage and lateral load requirements which are not discussed here. Frost heave may be critical in doorway areas. Stoops or sidewalks adjacent to doorways could be designed as structural slabs supported on frost footings with void spaces below. With this design, movements may then occur between the structural slab and the adjacent on-grade slabs. Non-frost susceptible sands (with less than 40% by weight passing a #40 sieve and no more than 5% by weight passing a #200 sieve) can be used below such areas. Depending on the function of surrounding areas, the sand layer may need a thickness transition away from the area where movement is critical. With sand placement over slower draining soils, subsurface drainage would be needed for the sand layer. High density extruded polystyrene insulation could be used within the sand to reduce frost penetration, thereby reducing the sand thickness needed. We caution that insulation placed near the surface can increase the potential for ice glazing of the surface.

The possible effects of adfreezing should be considered if clayey or silty soils are used as backfill. Adfreezing occurs when backfill adheres to rough surfaced foundation walls and lifts the wall as it freezes and heaves. This occurrence is most common with masonry block walls, unheated or poorly heated building situations and clay backfill. The potential is also increased where backfill soils are poorly compacted and become saturated. The risk of adfreezing can be decreased by placing a low friction separating layer between the wall and backfill.

Adfreezing can occur on exterior piers (such as deck, fence, or other similar pier footings), even if a smooth surface is provided. This is more likely in poor drainage situations where soils become saturated. Additional footing embedment and/or widened footings below the frost zones (which include tensile reinforcement) can be used to resist uplift forces. Specific designs would require individual analysis.

### **CONSTRUCTION CONSIDERATIONS**

Foundations, slabs and other improvements which may be affected by frost movements should be insulated from frost penetration during freezing weather. If filling takes place during freezing weather, all frozen soils, snow and ice should be stripped from areas to be filled prior to new fill placement. The new fill should not be allowed to freeze during transit, placement or compaction. This should be considered in the project scheduling, budgeting and quantity estimating. It is usually beneficial to perform cold weather earthwork operations in small areas where grade can be attained quickly rather than working larger areas where a greater amount of frost stripping may be needed. If slab subgrade areas freeze, we recommend the subgrade be thawed prior to floor slab placement. The frost action may also require reworking and recompaction of the thawed subgrade.

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## FLOOR SLAB MOISTURE/VAPOR PROTECTION

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Floor slab design relative to moisture/vapor protection should consider the type and location of two elements, a granular layer and a vapor membrane (vapor retarder, water resistant barrier or vapor barrier). In the following sections, the pros and cons of the possible options regarding these elements will be presented, such that you and your specifier can make an engineering decision based on the benefits and costs of the choices.

### **GRANULAR LAYER**

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In American Concrete Institute (ACI) 302.1R-15, a “base material” is recommended over the vapor membrane, rather than the conventional clean “sand cushion” material. The base layer should be a minimum of 4 inches (100 mm) thick, trimmable, compactable, granular fill (not sand), a so-called crusher-run material. Usually graded from 1½ inches to 2 inches (38 to 50 mm) down to rock dust is suitable. Following compaction, the surface can be choked off with a fine-grade material. We refer you to ACI 302.1R-15 for additional details regarding the requirements for the base material.

In cases where potential static water levels or significant perched water sources appear near or above the floor slab, an under floor drainage system may be needed wherein a drain tile system is placed within a thicker clean sand or gravel layer. Such a system should be properly engineered depending on subgrade soil types and rate/head of water inflow.

### **VAPOR MEMBRANE**

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The need for a vapor membrane depends on whether the floor slab will have a vapor sensitive covering, will have vapor sensitive items stored on the slab, or if the space above the slab will be a humidity controlled area. If the project does not have this vapor sensitivity or moisture control need, placement of a vapor membrane may not be necessary. Your decision will then relate to whether to use the ACI base material or a conventional sand cushion layer. However, if any of the above sensitivity issues apply, placement of a vapor membrane is recommended. Some floor covering systems (adhesives and flooring materials) require installation of a vapor membrane to limit the slab moisture content as a condition of their warranty.

### **VAPOR MEMBRANE/GRANULAR LAYER PLACEMENT**

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A number of issues should be considered when deciding whether to place the vapor membrane above or below the granular layer. The benefits of placing the slab on a granular layer, with the vapor membrane placed **below** the granular layer, include **reduction** of the following:

- Slab curling during the curing and drying process.
- Time of bleeding, which allows for quicker finishing.
- Vapor membrane puncturing.
- Surface blistering or delamination caused by an extended bleeding period.
- Cracking caused by plastic or drying shrinkage.

The benefits of placing the vapor membrane over the granular layer include the following:

- A lower moisture emission rate is achieved faster.
- Eliminates a potential water reservoir within the granular layer above the membrane.
- Provides a “slip surface”, thereby reducing slab restraint and the associated random cracking.

If a membrane is to be used in conjunction with a granular layer, the approach recommended depends on slab usage and the construction schedule. The vapor membrane should be placed above the granular layer when:

- Vapor sensitive floor covering systems are used or vapor sensitive items will be directly placed on the slab.
- The area will be humidity controlled, but the slab will be placed before the building is enclosed and sealed from rain.
- Required by a floor covering manufacturer’s system warranty.

The vapor membrane should be placed below the granular layer when:

- Used in humidity controlled areas (without vapor sensitive coverings/stored items), with the roof membrane in place, and the building enclosed to the point where precipitation will not intrude into the slab area. Consideration should be given to slight sloping of the membrane to edges where drain tile or other disposal methods can alleviate potential water sources, such as pipe or roof leaks, foundation wall damp proofing failure, fire sprinkler system activation, etc.

There may be cases where membrane placement may have a detrimental effect on the subgrade support system (e.g., expansive soils). In these cases, your decision will need to weigh the cost of subgrade options and the performance risks.

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## BASEMENT/RETAINING WALL BACKFILL AND WATER CONTROL

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### **DRAINAGE**

Below grade basements should include a perimeter backfill drainage system on the exterior side of the wall. The exception may be where basements lie within free draining sands where water will not perch in the backfill. Drainage systems should consist of perforated or slotted PVC drainage pipes located at the bottom of the backfill trench, lower than the interior floor grade. The drain pipe should be surrounded by properly graded filter rock. A geosynthetic “filter fabric” should then envelope the filter rock. The drain pipe should be connected to a suitable means of disposal, such as a sump basket or a gravity outfall. A storm sewer gravity outfall would be preferred over exterior daylighting, as the latter may freeze during winter. For non-building, exterior retaining walls, weep holes at the base of the wall can be substituted for a drain pipe.

### **BACKFILLING**

Prior to backfilling, damp/water proofing should be applied on perimeter basement walls. The backfill materials placed against basement walls will exert lateral loadings. To reduce this loading by allowing for drainage, we recommend using free-draining sands for backfill. The zone of sand backfill should extend outward from the wall at least 2 feet, and then upward and outward from the wall at a 30° or greater angle from vertical. The free-draining sand backfill should contain no more than 40% by weight passing the #40 sieve and no greater than 5% by weight passing the #200 sieve. The sand backfill should be placed in lifts and compacted with portable compaction equipment. This compaction should be to the specified levels if slabs or pavements are placed above. Where slab/pavements are not above, we recommend capping the sand backfill with a layer of clayey soil to minimize surface water infiltration. Positive surface drainage away from the building should also be maintained. If surface capping or positive surface drainage cannot be maintained, then the trench should be filled with more permeable soils, such as the Fine Filter or Coarse Filter Aggregates defined in MnDOT Specification 3149. You should recognize that if the backfill soils are not properly compacted, settlements may occur which may affect surface drainage away from the building.

Backfilling with silty or clayey soil is possible but not preferred. These soils can build-up water which increases lateral pressures and results in wet wall conditions and possible water infiltration into the basement. If you elect to place silty or clayey soils as backfill, we recommend you place a prefabricated drainage composite against the wall which is hydraulically connected to a drainage pipe at the base of the backfill trench. High plasticity clays should be avoided as backfill due to their swelling potential.

### **LATERAL PRESSURES**

Lateral earth pressures on below grade walls vary, depending on backfill soil classification, backfill compaction and slope of the backfill surface. Static or dynamic surcharge loads near the wall will also increase lateral wall pressure. For design, we recommend the following ultimate lateral earth pressure values (given in equivalent fluid pressure values) for a drained soil compacted to 95% of the Standard Proctor density and a level ground surface.

| Soil Type                         | Equivalent Fluid Density |               |
|-----------------------------------|--------------------------|---------------|
|                                   | Active (pcf)             | At-Rest (pcf) |
| Sands (SP or SP-SM)               | 35                       | 60            |
| Silty Sands (SM)                  | 45                       | 65            |
| Fine Grained Soils (SC, CL or ML) | 70                       | 90            |

Basement walls are normally restrained at the top which restricts movement. In this case, the design lateral pressures should be the “at-rest” pressure situation. Retaining walls which are free to rotate or deflect should be designed using the active case. Lateral earth pressures will be significantly higher than that shown if the backfill soils are not drained and become saturated.

## BORING LOG NOTES

### DRILLING AND SAMPLING SYMBOLS

| Symbol   | Definition                                                                                                                                                                                                                                        |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AR:      | Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.                                                                                                                                          |
| B, H, N: | Size of flush-joint casing                                                                                                                                                                                                                        |
| CAS:     | Pipe casing, number indicates nominal diameter in inches                                                                                                                                                                                          |
| COT:     | Clean-out tube                                                                                                                                                                                                                                    |
| DC:      | Drive casing; number indicates diameter in inches                                                                                                                                                                                                 |
| DM:      | Drilling mud or bentonite slurry                                                                                                                                                                                                                  |
| DR:      | Driller (initials)                                                                                                                                                                                                                                |
| DS:      | Disturbed sample from auger flights                                                                                                                                                                                                               |
| DP:      | Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.                                                                                                                  |
| FA:      | Flight auger; number indicates outside diameter in inches                                                                                                                                                                                         |
| HA:      | Hand auger; number indicates outside diameter                                                                                                                                                                                                     |
| HSA:     | Hollow stem auger; number indicates inside diameter in inches                                                                                                                                                                                     |
| LG:      | Field logger (initials)                                                                                                                                                                                                                           |
| MC:      | Column used to describe moisture condition of samples and for the ground water level symbols                                                                                                                                                      |
| N (BPF): | Standard penetration resistance (N-value) in blows per foot (see notes)                                                                                                                                                                           |
| NQ:      | NQ wireline core barrel                                                                                                                                                                                                                           |
| PQ:      | PQ wireline core barrel                                                                                                                                                                                                                           |
| RDA:     | Rotary drilling with compressed air and roller or drag bit.                                                                                                                                                                                       |
| RDF:     | Rotary drilling with drilling fluid and roller or drag bit                                                                                                                                                                                        |
| REC:     | In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered. |
| SS:      | Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise                                                                                                                                    |
| SU       | Spin-up sample from hollow stem auger                                                                                                                                                                                                             |
| TW:      | Thin-walled tube; number indicates inside diameter in inches                                                                                                                                                                                      |
| WASH:    | Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid                                                                                     |
| WH:      | Sampler advanced by static weight of drill rod and hammer                                                                                                                                                                                         |
| WR:      | Sampler advanced by static weight of drill rod                                                                                                                                                                                                    |
| 94mm:    | 94 millimeter wireline core barrel                                                                                                                                                                                                                |
| ▼:       | Water level directly measured in boring                                                                                                                                                                                                           |
| ▽:       | Estimated water level based solely on sample appearance                                                                                                                                                                                           |

### TEST SYMBOLS

| Symbol           | Definition                                                                                                                              |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| CONS:            | One-dimensional consolidation test                                                                                                      |
| DEN:             | Dry density, pcf                                                                                                                        |
| DST:             | Direct shear test                                                                                                                       |
| E:               | Pressuremeter Modulus, tsf                                                                                                              |
| HYD:             | Hydrometer analysis                                                                                                                     |
| LL:              | Liquid Limit, %                                                                                                                         |
| LP:              | Pressuremeter Limit Pressure, tsf                                                                                                       |
| OC:              | Organic Content, %                                                                                                                      |
| PERM:            | Coefficient of permeability (K) test; F - Field; L - Laboratory                                                                         |
| PL:              | Plastic Limit, %                                                                                                                        |
| q <sub>p</sub> : | Pocket Penetrometer strength, tsf ( <u>approximate</u> )                                                                                |
| q <sub>c</sub> : | Static cone bearing pressure, tsf                                                                                                       |
| q <sub>u</sub> : | Unconfined compressive strength, psf                                                                                                    |
| R:               | Electrical Resistivity, ohm-cms                                                                                                         |
| RQD:             | Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run) |
| SA:              | Sieve analysis                                                                                                                          |
| TRX:             | Triaxial compression test                                                                                                               |
| VSR:             | Vane shear strength, remolded (field), psf                                                                                              |
| VSU:             | Vane shear strength, undisturbed (field), psf                                                                                           |
| WC:              | Water content, as percent of dry weight                                                                                                 |
| %-200:           | Percent of material finer than #200 sieve                                                                                               |

### STANDARD PENETRATION TEST NOTES

The standard penetration test consists of driving a split-spoon sampler with a drop hammer counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

# UNIFIED SOIL CLASSIFICATION SYSTEM

## ASTM Designations: D 2487, D2488

AMERICAN  
ENGINEERING  
TESTING, INC.



| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>    |                                                               |                                                              |                                                          | Soil Classification |                                                                    | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------|---------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                             |                                                               |                                                              |                                                          | Group Symbol        | Group Name <sup>B</sup>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Coarse-Grained Soils More than 50% retained on No. 200 sieve                                | Gravels More than 50% coarse fraction retained on No. 4 sieve | Clean Gravels Less than 5% fines <sup>C</sup>                | Cu≥4 and 1≤Cc≤3 <sup>E</sup>                             | GW                  | Well graded gravel <sup>F</sup>                                    | <sup>A</sup> Based on the material passing the 3-in (75-mm) sieve.<br><sup>B</sup> If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.<br><sup>C</sup> Gravels with 5 to 12% fines require dual symbols:<br>GW-GM well-graded gravel with silt<br>GW-GC well-graded gravel with clay<br>GP-GM poorly graded gravel with silt<br>GP-GC poorly graded gravel with clay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               |                                                              | Cu<4 and/or 1>Cc>3 <sup>E</sup>                          | GP                  | Poorly graded gravel <sup>F</sup>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             | Sands 50% or more of coarse fraction passes No. 4 sieve       | Gravels with Fines more than 12% fines <sup>C</sup>          | Fines classify as ML or MH                               | GM                  | Silty gravel <sup>F,G,H</sup>                                      | <sup>D</sup> Sands with 5 to 12% fines require dual symbols:<br>SW-SM well-graded sand with silt<br>SW-SC well-graded sand with clay<br>SP-SM poorly graded sand with silt<br>SP-SC poorly graded sand with clay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                             |                                                               |                                                              | Fines classify as CL or CH                               | GC                  | Clayey gravel <sup>F,G,H</sup>                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               | Clean Sands Less than 5% fines <sup>D</sup>                  | Cu≥6 and 1≤Cc≤3 <sup>E</sup>                             | SW                  | Well-graded sand <sup>I</sup>                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               |                                                              | Cu<6 and/or 1>Cc>3 <sup>E</sup>                          | SP                  | Poorly-graded sand <sup>I</sup>                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Fine-Grained Soils 50% or more passes the No. 200 sieve<br><br>(see Plasticity Chart below) | Silts and Clays Liquid limit less than 50                     | inorganic                                                    | PI>7 and plots on or above “A” line <sup>J</sup>         | CL                  | Lean clay <sup>K,L,M</sup>                                         | $E_{Cu} = D_{60} / D_{10}, \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$<br><br><sup>F</sup> If soil contains ≥15% sand, add “with sand” to group name.<br><sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.<br><sup>H</sup> If fines are organic, add “with organic fines” to group name.<br><sup>I</sup> If soil contains ≥15% gravel, add “with gravel” to group name.<br><sup>J</sup> If Atterberg limits plot is hatched area, soil is a CL-ML silty clay.<br><sup>K</sup> If soil contains 15 to 29% plus No. 200 add “with sand” or “with gravel”, whichever is predominant.<br><sup>L</sup> If soil contains ≥30% plus No. 200, predominantly sand, add “sandy” to group name.<br><sup>M</sup> If soil contains ≥30% plus No. 200, predominantly gravel, add “gravelly” to group name.<br><sup>N</sup> PI≥4 and plots on or above “A” line.<br><sup>O</sup> PI<4 or plots below “A” line.<br><sup>P</sup> PI plots on or above “A” line.<br><sup>Q</sup> PI plots below “A” line.<br><sup>R</sup> Fiber Content description shown below. |
|                                                                                             |                                                               |                                                              | PI<4 or plots below “A” line <sup>J</sup>                | ML                  | Silt <sup>K,L,M</sup>                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               | organic                                                      | Liquid limit—oven dried <0.75<br>Liquid limit— not dried | OL                  | Organic clay <sup>K,L,M,N</sup><br>Organic silt <sup>K,L,M,O</sup> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               |                                                              |                                                          |                     |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             | Silts and Clays Liquid limit 50 or more                       | inorganic                                                    | PI plots on or above “A” line                            | CH                  | Fat clay <sup>K,L,M</sup>                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               |                                                              | PI plots below “A” line                                  | MH                  | Elastic silt <sup>K,L,M</sup>                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               | organic                                                      | Liquid limit—oven dried <0.75<br>Liquid limit— not dried | OH                  | Organic clay <sup>K,L,M,P</sup><br>Organic silt <sup>K,L,M,Q</sup> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                             |                                                               |                                                              |                                                          |                     |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Highly organic soil                                                                         |                                                               | Primarily organic matter, dark in color, and organic in odor | PT                                                       | Peat <sup>R</sup>   |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**SIEVE ANALYSIS**

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils

Equation of “A” line  
Horizontal at PI = 4 to LL = 25.5,  
then PI = 0.73 (LL-20)

Equation of “U” line  
Vertical at LL = 16 to PI = 7,  
then PI = 0.9 (LL-8)

Plasticity Chart

### Notes

<sup>A</sup>Based on the material passing the 3-in (75-mm) sieve.

<sup>B</sup>If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup>Gravels with 5 to 12% fines require dual symbols:

GW-GM well-graded gravel with silt  
GW-GC well-graded gravel with clay  
GP-GM poorly graded gravel with silt  
GP-GC poorly graded gravel with clay

<sup>D</sup>Sands with 5 to 12% fines require dual symbols:

SW-SM well-graded sand with silt  
SW-SC well-graded sand with clay  
SP-SM poorly graded sand with silt  
SP-SC poorly graded sand with clay

$$^E C_u = D_{60} / D_{10}, \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup>If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup>If fines are organic, add "with organic fines" to group name.

<sup>I</sup>If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup>If Atterberg limits plot is hatched area, soil is a CL-ML silty clay.

<sup>K</sup>If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

<sup>L</sup>If soil contains  $\geq 30\%$  plus No. 200, predominantly sand, add "sandy" to group name.

<sup>M</sup>If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

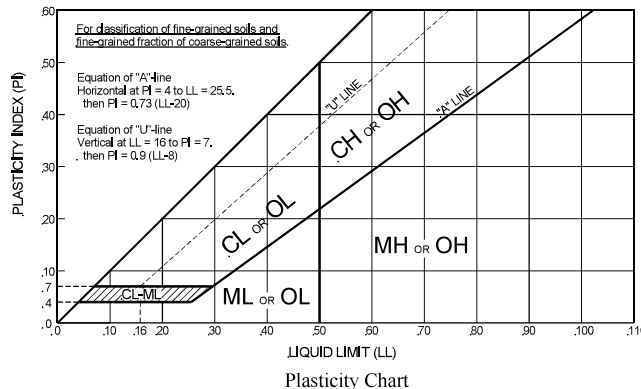
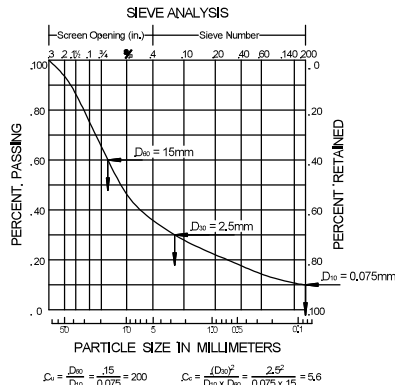
<sup>N</sup>PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup>PI < 4 or plots below "A" line.

<sup>P</sup>PI plots on or above "A" line.

<sup>Q</sup>PI plots below "A" line.

<sup>R</sup>Fiber Content description shown below.



### ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

| Grain Size               |                                                                                                                       | Gravel Percentages |                                                                           | Consistency of Plastic Soils |                                 | Relative Density of Non-Plastic Soils                                                                                                                                                                           |                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------|------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Term                     | Particle Size                                                                                                         | Term               | Percent                                                                   | Term                         | N-Value, BPF                    | Term                                                                                                                                                                                                            | N-Value, BPF    |
| Boulders                 | Over 12"                                                                                                              | A Little Gravel    | 3% - 14%                                                                  | Very Soft                    | less than 2                     | Very Loose                                                                                                                                                                                                      | 0 - 4           |
| Cobbles                  | 3" to 12"                                                                                                             | With Gravel        | 15% - 29%                                                                 | Soft                         | 2 - 4                           | Loose                                                                                                                                                                                                           | 5 - 10          |
| Gravel                   | #4 sieve to 3"                                                                                                        | Gravelly           | 30% - 50%                                                                 | Firm                         | 5 - 8                           | Medium Dense                                                                                                                                                                                                    | 11 - 30         |
| Sand                     | #200 to #4 sieve                                                                                                      |                    |                                                                           | Stiff                        | 9 - 15                          | Dense                                                                                                                                                                                                           | 31 - 50         |
| Fines (silt & clay)      | Pass #200 sieve                                                                                                       |                    |                                                                           | Very Stiff                   | 16 - 30                         | Very Dense                                                                                                                                                                                                      | Greater than 50 |
|                          |                                                                                                                       |                    |                                                                           | Hard                         | Greater than 30                 |                                                                                                                                                                                                                 |                 |
| Moisture/Frost Condition |                                                                                                                       | Layering Notes     |                                                                           | Peat Description             |                                 | Organic Description (if no lab tests)                                                                                                                                                                           |                 |
| (MC Column)              |                                                                                                                       |                    |                                                                           |                              |                                 |                                                                                                                                                                                                                 |                 |
| D (Dry):                 | Absence of moisture, dusty, dry to touch.                                                                             | Laminations:       | Layers less than 1/2" thick of differing material or color.               | Term                         | Fiber Content (Visual Estimate) | Soils are described as <i>organic</i> , if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. <i>Slightly organic</i> used for borderline cases. |                 |
| M (Moist):               | Damp, although free water not visible. Soil may still have a high water content (over "optimum").                     |                    |                                                                           | Fibric Peat:                 | Greater than 67%                | <b>Root Inclusions</b>                                                                                                                                                                                          |                 |
| W (Wet/ Waterbearing):   | Free water visible, intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt. | Lenses:            | Pockets or layers greater than 1/2" thick of differing material or color. | Hemic Peat:                  | 33 - 67%                        | With roots: Judged to have sufficient quantity of roots to influence the soil properties.                                                                                                                       |                 |
| F (Frozen):              | Soil frozen                                                                                                           |                    |                                                                           | Sapric Peat:                 | Less than 33%                   | Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.                                                                                          |                 |



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-01 (p. 1 of 1)**

PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**

SURFACE ELEVATION: **884** LATITUDE: **44.949175** LONGITUDE: **-93.277683**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                 | GEOLOGY                 | N  | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |       |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|----|----|----------------|------------|--------------------------|-----|----|----|-------|
|                     |                                                                                      |                         |    |    |                |            | WC                       | DEN | LL | PL | %#200 |
| 1                   | 3 1/2' Bituminous pavement                                                           | FILL                    | 12 | M  | SS             | 16         |                          |     |    |    |       |
| 2                   | 6" FILL, silty sand with gravel, brown (apparent base)                               |                         |    |    |                |            |                          |     |    |    |       |
| 3                   | FILL, mostly silty sand with gravel, brown and dark brown                            |                         | 12 | M  | SS             | 18         |                          |     |    |    | 13    |
| 4                   |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 5                   |                                                                                      |                         | 4  | M  | SS             | 16         |                          |     |    |    |       |
| 6                   |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 7                   | GRAVELLY SAND, fine to medium grained, brown, moist, loose (SP) (possible fill)      | COARSE ALLUVIUM OR FILL | 6  | M  | SS             | 14         |                          |     |    |    |       |
| 8                   |                                                                                      | COARSE ALLUVIUM         |    |    |                |            |                          |     |    |    |       |
| 9                   | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense (SP) |                         | 12 | M  | SS             | 18         |                          |     |    |    |       |
| 10                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 11                  |                                                                                      |                         | 13 | M  | SS             | 16         |                          |     |    |    |       |
| 12                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 13                  |                                                                                      |                         | 25 | M  | SS             | 18         |                          |     |    |    |       |
| 14                  | SAND, fine to medium grained, light brown, moist, medium dense (SP)                  |                         |    |    |                |            |                          |     |    |    |       |
| 15                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 16                  |                                                                                      |                         | 17 | M  | SS             | 20         |                          |     |    |    |       |
| 17                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 18                  | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense (SP) |                         |    |    |                |            |                          |     |    |    |       |
| 19                  |                                                                                      |                         | 43 | M  | SS             | 24         |                          |     |    |    |       |
| 20                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 21                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 22                  |                                                                                      |                         | 51 | M  | SS             | 24         |                          |     |    |    |       |
| 23                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 24                  | SAND, fine grained, light brown, moist, dense to very dense (SP)                     |                         |    |    |                |            |                          |     |    |    |       |
| 25                  |                                                                                      |                         | 47 | M  | SS             | 24         |                          |     |    |    |       |
| 26                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 27                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 28                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 29                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 30                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 31                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 32                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 33                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 34                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 35                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| 36                  |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |
| END OF BORING       |                                                                                      |                         |    |    |                |            |                          |     |    |    |       |

| DEPTH: DRILLING METHOD   |           | WATER LEVEL MEASUREMENTS |       |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--------------------------|-----------|--------------------------|-------|---------------|--------------|---------------|----------------------|-------------|----------------------------------------------------------------------------------|
|                          |           | DATE                     | TIME  | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |                                                                                  |
| 0-34 1/2'                | 3.25" HSA | 9/5/25                   | 10:45 | 36.5          | 34.5         | 36.5          |                      | None        |                                                                                  |
|                          |           | 9/5/25                   | 10:55 | 36.5          | 34.5         | 36.4          |                      | None        |                                                                                  |
| BORING COMPLETED: 9/5/25 |           |                          |       |               |              |               |                      |             |                                                                                  |
| DR: JC LG: GH Rig: 110   |           |                          |       |               |              |               |                      |             |                                                                                  |

AET CORP W/LAT+LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-02 (p. 1 of 1)**

PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**

SURFACE ELEVATION: **882** LATITUDE: **44.949030** LONGITUDE: **-93.277192**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                                                           | GEOLOGY            | N  | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |       |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|----|----|----------------|------------|--------------------------|-----|----|----|-------|
|                     |                                                                                                                                |                    |    |    |                |            | WC                       | DEN | LL | PL | %#200 |
| 1                   | 3" Bituminous pavement                                                                                                         | FILL               | 18 | M  | SS             | 14         |                          |     |    |    |       |
| 2                   | FILL, mostly sand with silt, a little clayey sand with gravel, pieces of bituminous, brown                                     |                    |    |    |                |            |                          |     |    |    |       |
| 3                   |                                                                                                                                |                    | 19 | M  | SS             | 20         |                          |     |    |    |       |
| 4                   |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 5                   | FILL, mixture of sand and silty sand, a little gravel, light brown and brown                                                   | COARSE<br>ALLUVIUM | 5  | M  | SS             | 16         |                          |     |    |    |       |
| 6                   |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 7                   |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 8                   | SAND, a little gravel, fine to medium grained, light brown, moist, loose (SP)                                                  |                    | 9  | M  | SS             | 18         |                          |     |    |    |       |
| 9                   |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 10                  | SAND WITH GRAVEL, fine to medium grained, light brown, moist, medium dense, laminations of clayey sand (SP)                    |                    | 18 | M  | SS             | 18         |                          |     |    |    |       |
| 11                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 12                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 13                  | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense, lenses and laminations of sand with silt (SP) |                    | 19 | M  | SS             | 20         |                          |     |    |    |       |
| 14                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 15                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 16                  |                                                                                                                                |                    | 21 | M  | SS             | 20         |                          |     |    |    |       |
| 17                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 18                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 19                  | SAND, mostly fine grained, brown, moist, dense (SP)                                                                            |                    |    |    |                |            |                          |     |    |    |       |
| 20                  |                                                                                                                                |                    |    |    |                |            |                          |     |    |    |       |
| 21                  |                                                                                                                                |                    | 32 | M  | SS             | 22         |                          |     |    |    |       |
|                     | <b>END OF BORING</b>                                                                                                           |                    |    |    |                |            |                          |     |    |    |       |

| DEPTH: DRILLING METHOD                      |                  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|---------------------------------------------|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|-------------------------------------------------------------------------------------------------|
|                                             |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |                                                                                                 |
| <b>0-19½'</b>                               | <b>3.25" HSA</b> | <b>9/3/25</b>            | <b>1:55</b> | <b>21.5</b>      | <b>19.5</b>     | <b>21.5</b>      |                         | <b>None</b>    |                                                                                                 |
|                                             |                  | <b>9/3/25</b>            | <b>2:05</b> | <b>21.5</b>      | <b>19.5</b>     | <b>21.4</b>      |                         | <b>None</b>    |                                                                                                 |
| BORING<br>COMPLETED: <b>9/3/25</b>          |                  |                          |             |                  |                 |                  |                         |                |                                                                                                 |
| DR: <b>JC</b> LG: <b>GH</b> Rig: <b>110</b> |                  |                          |             |                  |                 |                  |                         |                |                                                                                                 |

AET CORP W-LAT-LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25



# SUBSURFACE BORING LOG

| AET JOB NO: <b>P-0045582</b>                                |                                                                                                                 |                    |    | LOG OF BORING NO. <b>B-03 (p. 1 of 1)</b> |                |            |                          |                              |    |    |       |  |  |  |  |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------|----|-------------------------------------------|----------------|------------|--------------------------|------------------------------|----|----|-------|--|--|--|--|
| PROJECT: <b>New Nicollet Redevelopment; Minneapolis, MN</b> |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| SURFACE ELEVATION: <b>885</b>                               |                                                                                                                 |                    |    | LATITUDE: <b>44.949176</b>                |                |            |                          | LONGITUDE: <b>-93.276871</b> |    |    |       |  |  |  |  |
| DEPTH<br>IN<br>FEET                                         | MATERIAL DESCRIPTION                                                                                            | GEOLOGY            | N  | MC                                        | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |                              |    |    |       |  |  |  |  |
|                                                             |                                                                                                                 |                    |    |                                           |                |            | WC                       | DEN                          | LL | PL | %#200 |  |  |  |  |
| 1                                                           | 3" Bituminous pavement                                                                                          | FILL               | 8  | M                                         | SS             | 16         |                          |                              |    |    |       |  |  |  |  |
| 2                                                           | FILL, mostly sand, a little gravel, pieces of bituminous, dark brown                                            |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 3                                                           | FILL, mixture of sand and silty sand, a little gravel, brown and dark brown                                     | COARSE<br>ALLUVIUM | 12 | M                                         | SS             | 16         |                          |                              |    |    |       |  |  |  |  |
| 4                                                           | FILL, mixture of gravelly silty sand and clayey sand, dark brown                                                |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 5                                                           | SAND, mostly fine grained, light brown, moist, loose, laminations of sand with silt (SP)                        |                    | 9  | M                                         | SS             | 18         |                          |                              |    |    |       |  |  |  |  |
| 6                                                           | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense, laminations of silty sand (SP) |                    | 16 | M                                         | SS             | 20         |                          |                              |    |    |       |  |  |  |  |
| 7                                                           | GRAVELLY SAND, medium to fine grained, light brown to brown, moist, loose to medium dense (SP)                  |                    | 17 | M                                         | SS             | 20         |                          |                              |    |    |       |  |  |  |  |
| 8                                                           |                                                                                                                 |                    | 9  | M                                         | SS             | 18         |                          |                              |    |    |       |  |  |  |  |
| 9                                                           |                                                                                                                 |                    | 21 | M                                         | SS             | 22         |                          |                              |    |    |       |  |  |  |  |
| 10                                                          |                                                                                                                 |                    | 48 | M                                         | SS             | 22         |                          |                              |    |    |       |  |  |  |  |
| 11                                                          |                                                                                                                 |                    | 54 | M                                         | SS             | 24         |                          |                              |    |    |       |  |  |  |  |
| 12                                                          |                                                                                                                 |                    | 50 | M                                         | SS             | 24         |                          |                              |    |    |       |  |  |  |  |
| 13                                                          |                                                                                                                 | 33                 | M  | SS                                        | 22             |            |                          |                              |    |    |       |  |  |  |  |
| 14                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 15                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 16                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 17                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 18                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 19                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 20                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 21                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 22                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 23                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 24                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 25                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 26                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 27                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 28                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 29                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 30                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 31                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 32                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 33                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 34                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 35                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| 36                                                          |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |
| <b>END OF BORING</b>                                        |                                                                                                                 |                    |    |                                           |                |            |                          |                              |    |    |       |  |  |  |  |

| DEPTH: DRILLING METHOD                      |                  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------------|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|----------------------------------------------------------------------------------|
|                                             |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |                                                                                  |
| <b>0-34½'</b>                               | <b>3.25" HSA</b> | <b>9/3/25</b>            | <b>12:31</b> | <b>36.5</b>   | <b>34.5</b>  | <b>35.6</b>   |                      | <b>None</b> |                                                                                  |
|                                             |                  | <b>9/3/25</b>            | <b>12:41</b> | <b>36.5</b>   | <b>34.5</b>  | <b>35.5</b>   |                      | <b>None</b> |                                                                                  |
| BORING COMPLETED: <b>9/3/25</b>             |                  |                          |              |               |              |               |                      |             |                                                                                  |
| DR: <b>JC</b> LG: <b>GH</b> Rig: <b>110</b> |                  |                          |              |               |              |               |                      |             |                                                                                  |

AET CORP W-LAT+LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-04 (p. 1 of 1)**

PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**

SURFACE ELEVATION: **882** LATITUDE: **44.948882** LONGITUDE: **-93.277693**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                                                                    | GEOLOGY            | N  | MC                                                                                  | SAMPLE<br>TYPE                                                                        | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------|----|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------|--------------------------|-----|----|----|--------|--|
|                     |                                                                                                                                         |                    |    |                                                                                     |                                                                                       |            | WC                       | DEN | LL | PL | %-#200 |  |
| 1                   | 3" Bituminous pavement                                                                                                                  | FILL               |    |                                                                                     |                                                                                       |            |                          |     |    |    |        |  |
| 2                   | 6" FILL, silty sand with gravel, brown (apparent base)                                                                                  |                    | 19 | M                                                                                   |    | SS         | 8                        |     |    |    |        |  |
| 3                   | FILL, a mixture of sand, sand with silt, clayey sand and sandy lean clay, a little gravel and a piece of concrete, brown and dark brown |                    | 13 | M                                                                                   |    | SS         | 18                       |     |    |    |        |  |
| 4                   |                                                                                                                                         |                    |    |                                                                                     |    |            |                          |     |    |    |        |  |
| 5                   |                                                                                                                                         |                    |    |                                                                                     |    | SS         | 14                       |     |    |    |        |  |
| 6                   |                                                                                                                                         |                    |    |                                                                                     |    |            |                          |     |    |    |        |  |
| 7                   | GRAVELLY SAND, fine to medium grained, light brown, moist, medium dense (SP)                                                            | COARSE<br>ALLUVIUM |    |                                                                                     |                                                                                       |            |                          |     |    |    |        |  |
| 8                   |                                                                                                                                         |                    | 16 | M                                                                                   |    | SS         | 18                       |     |    |    |        |  |
| 9                   |                                                                                                                                         |                    |    |                                                                                     |    |            |                          |     |    |    |        |  |
| 10                  |                                                                                                                                         |                    | 29 | M                                                                                   |    | SS         | 16                       |     |    |    |        |  |
| 11                  |                                                                                                                                         |                    |    |  |                                                                                       |            |                          |     |    |    |        |  |
| 12                  | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense to dense (SP)                                           |                    | 21 | M                                                                                   |    | SS         | 20                       |     |    |    |        |  |
| 13                  |                                                                                                                                         |                    |    |                                                                                     |    |            |                          |     |    |    |        |  |
| 14                  |                                                                                                                                         |                    | 15 | M                                                                                   |    | SS         | 20                       |     |    |    |        |  |
| 15                  |                                                                                                                                         |                    |    |                                                                                     |    |            |                          |     |    |    |        |  |
| 16                  |                                                                                                                                         |                    |    |                                                                                     |  |            |                          |     |    |    |        |  |
| 17                  |                                                                                                                                         |                    |    |                                                                                     |  |            |                          |     |    |    |        |  |
| 18                  |                                                                                                                                         |                    |    |                                                                                     |  |            |                          |     |    |    |        |  |
| 19                  |                                                                                                                                         |                    |    |                                                                                     |  |            |                          |     |    |    |        |  |
| 20                  |                                                                                                                                         |                    |    |                                                                                     |  |            |                          |     |    |    |        |  |
| 21                  |                                                                                                                                         |                    | 32 | M                                                                                   |  | SS         | 22                       |     |    |    |        |  |
| END OF BORING       |                                                                                                                                         |                    |    |                                                                                     |                                                                                       |            |                          |     |    |    |        |  |

| DEPTH: DRILLING METHOD   |           | WATER LEVEL MEASUREMENTS |      |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--------------------------|-----------|--------------------------|------|---------------|--------------|---------------|----------------------|-------------|----------------------------------------------------------------------------------|
| 0-19½'                   | 3.25" HSA | DATE                     | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |                                                                                  |
|                          |           | 9/4/25                   | 1:30 | 21.5          | 19.5         | 19.7          |                      | None        |                                                                                  |
|                          |           | 9/4/25                   | 1:40 | 21.5          | 19.5         | 19.7          |                      | None        |                                                                                  |
| BORING COMPLETED: 9/4/25 |           |                          |      |               |              |               |                      |             |                                                                                  |
| DR: JC LG: GH Rig: 110   |           |                          |      |               |              |               |                      |             |                                                                                  |

AET CORP W/LAT+LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-05 (p. 1 of 1)**

PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**

SURFACE ELEVATION: **883** LATITUDE: **44.948831** LONGITUDE: **-93.276867**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                 | GEOLOGY            | N  | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |       |
|---------------------|--------------------------------------------------------------------------------------|--------------------|----|----|----------------|------------|--------------------------|-----|----|----|-------|
|                     |                                                                                      |                    |    |    |                |            | WC                       | DEN | LL | PL | %#200 |
| 1                   | 3" Bituminous pavement                                                               | FILL               | 17 | M  | SS             | 22         |                          |     |    |    |       |
| 2                   | 5" FILL, silty sand with gravel, brown (apparent base)                               |                    |    |    |                |            |                          |     |    |    |       |
| 3                   | FILL, a mixture of silty sand and clayey sand with gravel, brown and dark brown      |                    | 27 | M  | SS             | 20         |                          |     |    |    |       |
| 4                   |                                                                                      | COARSE<br>ALLUVIUM |    |    |                |            |                          |     |    |    |       |
| 5                   | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense (SP) |                    | 15 | M  | SS             | 22         |                          |     |    |    |       |
| 6                   |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 7                   |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 8                   |                                                                                      |                    | 12 | M  | SS             | 22         |                          |     |    |    |       |
| 9                   |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 10                  | SAND WITH GRAVEL, fine to medium grained, light brown, moist, medium dense (SP)      |                    | 12 | M  | SS             | 18         |                          |     |    |    |       |
| 11                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 12                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 13                  |                                                                                      |                    | 16 | M  | SS             | 14         |                          |     |    |    |       |
| 14                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 15                  | SAND, fine to medium grained, light brown, moist, medium dense (SP)                  |                    | 15 | M  | SS             | 22         |                          |     |    |    |       |
| 16                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 17                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 18                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 19                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 20                  |                                                                                      |                    |    |    |                |            |                          |     |    |    |       |
| 21                  |                                                                                      |                    | 21 | M  | SS             | 20         |                          |     |    |    |       |
|                     | <b>END OF BORING</b>                                                                 |                    |    |    |                |            |                          |     |    |    |       |

| DEPTH: DRILLING METHOD                      |                  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|---------------------------------------------|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|-------------------------------------------------------------------------------------------------|
|                                             |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |                                                                                                 |
| <b>0-19½'</b>                               | <b>3.25" HSA</b> | <b>9/4/25</b>            | <b>9:15</b> | <b>21.5</b>      | <b>19.5</b>     | <b>21.5</b>      |                         | <b>None</b>    |                                                                                                 |
|                                             |                  | <b>9/4/25</b>            | <b>9:25</b> | <b>21.5</b>      | <b>19.5</b>     | <b>21.4</b>      |                         | <b>None</b>    |                                                                                                 |
| BORING<br>COMPLETED: <b>9/4/25</b>          |                  |                          |             |                  |                 |                  |                         |                |                                                                                                 |
| DR: <b>JC</b> LG: <b>GH</b> Rig: <b>110</b> |                  |                          |             |                  |                 |                  |                         |                |                                                                                                 |

AET CORP W-LAT-LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25

# SUBSURFACE BORING LOG



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-07 (p. 1 of 1)**

PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**

SURFACE ELEVATION: **884** LATITUDE: **44.948537** LONGITUDE: **-93.277676**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                          | GEOLOGY            | N  | MC | SAMPLE<br>TYPE                                                                        | REC<br>IN.                                                                            | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------------|-----------------------------------------------------------------------------------------------|--------------------|----|----|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------|-----|----|----|--------|--|
|                     |                                                                                               |                    |    |    |                                                                                       |                                                                                       | WC                       | DEN | LL | PL | %-#200 |  |
| 1                   | 4" Bituminous pavement                                                                        | FILL               |    |    |                                                                                       |                                                                                       |                          |     |    |    |        |  |
| 2                   | 6" FILL, silty sand with gravel, brown (apparent base)                                        |                    | 12 | M  |    | SS                                                                                    | 16                       |     |    |    |        |  |
| 3                   | FILL, mostly silty sand, a little clayey sand, a little gravel, brown                         |                    | 17 | M  |    | SS                                                                                    | 18                       |     |    |    | 2      |  |
| 4                   |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 5                   | FILL, mostly sand, light brown, a little dark brown and black                                 |                    | 17 | M  |    | SS                                                                                    | 22                       |     |    |    |        |  |
| 6                   |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 7                   |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 8                   |                                                                                               |                    |    |    |    | SS                                                                                    | 20                       |     |    |    |        |  |
| 9                   |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 10                  | FILL, mostly sand with silt with gravel, brown                                                |                    |    |    |                                                                                       |                                                                                       |                          |     |    |    |        |  |
| 11                  |                                                                                               |                    | 20 | M  |    | SS                                                                                    | 14                       |     |    |    |        |  |
| 12                  |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 13                  | SAND WITH GRAVEL, fine to medium grained, light brown, moist, medium dense (SP)               | COARSE<br>ALLUVIUM | 22 | M  |    | SS                                                                                    | 18                       |     |    |    |        |  |
| 14                  |                                                                                               |                    |    |    |    |                                                                                       |                          |     |    |    |        |  |
| 15                  | SAND, fine to medium grained, light brown, moist, medium dense (SP)                           |                    |    | 15 | M                                                                                     |    | SS                       | 20  |    |    |        |  |
| 16                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 17                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 18                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 19                  | SAND, a little gravel, fine to medium grained, light brown, moist, medium dense to dense (SP) |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 20                  |                                                                                               |                    |    | 17 | M                                                                                     |  | SS                       | 22  |    |    |        |  |
| 21                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 22                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 23                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 24                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 25                  |                                                                                               |                    |    | 26 | M                                                                                     |  | SS                       | 20  |    |    |        |  |
| 26                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 27                  |                                                                                               |                    |    |    |                                                                                       |  |                          |     |    |    |        |  |
| 28                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 29                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 30                  |                                                                                               |                    | 42 | M  |  | SS                                                                                    | 24                       |     |    |    |        |  |
| 31                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 32                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 33                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 34                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 35                  |                                                                                               |                    |    |    |  |                                                                                       |                          |     |    |    |        |  |
| 36                  |                                                                                               |                    | 45 | M  |  | SS                                                                                    | 18                       |     |    |    |        |  |
|                     | END OF BORING                                                                                 |                    |    |    |                                                                                       |                                                                                       |                          |     |    |    |        |  |

| DEPTH: DRILLING METHOD      |           | WATER LEVEL MEASUREMENTS |      |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|-----------------------------|-----------|--------------------------|------|------------------|-----------------|------------------|-------------------------|----------------|-------------------------------------------------------------------------------------------------|
|                             |           | DATE                     | TIME | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |                                                                                                 |
| 0-34½'                      | 3.25" HSA | 9/5/25                   | 9:23 | 36.5             | 34.5            | 36.4             |                         | None           |                                                                                                 |
|                             |           | 9/5/25                   | 9:33 | 36.5             | 34.5            | 36.2             |                         | None           |                                                                                                 |
| BORING<br>COMPLETED: 9/5/25 |           |                          |      |                  |                 |                  |                         |                |                                                                                                 |
| DR: JC LG: GH Rig: 110      |           |                          |      |                  |                 |                  |                         |                |                                                                                                 |

AET CORP W-LAT-LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25



# SUBSURFACE BORING LOG

AET JOB NO: **P-0045582** LOG OF BORING NO. **B-08 (p. 1 of 1)**  
 PROJECT: **New Nicollet Redevelopment; Minneapolis, MN**  
 SURFACE ELEVATION: **884** LATITUDE: **44.948567** LONGITUDE: **-93.276866**

| DEPTH<br>IN<br>FEET | MATERIAL DESCRIPTION                                                                                    |                                                                                     | GEOLOGY         | N                                                                   | MC                                                                                  | SAMPLE<br>TYPE                                                                        | REC<br>IN.                                                                            | FIELD & LABORATORY TESTS                                                              |     |    |    |       |  |
|---------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----|----|----|-------|--|
|                     |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       | WC                                                                                    | DEN | LL | PL | %#200 |  |
| 1                   | FILL, mostly silty sand, a little clayey sand, a little gravel, trace roots, brown and dark brown       |                                                                                     | FILL            | 14                                                                  | M                                                                                   |    | SS                                                                                    | 20                                                                                    |     |    |    |       |  |
| 2                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 3                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 4                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 5                   | FILL, mostly sand, a little silty sand and sandy lean clay, a little gravel, brown, a little dark brown |                                                                                     |                 | 24                                                                  | M                                                                                   |    | SS                                                                                    | 20                                                                                    |     |    |    |       |  |
| 6                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 7                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 8                   |                                                                                                         |                                                                                     |                 | 15                                                                  | M                                                                                   |    | SS                                                                                    | 18                                                                                    |     |    |    |       |  |
| 9                   |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 10                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 11                  |                                                                                                         |                                                                                     |                 | 20                                                                  | M                                                                                   |    | SS                                                                                    | 18                                                                                    |     |    |    |       |  |
| 12                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 13                  |                                                                                                         |                                                                                     |                 | 39                                                                  | M                                                                                   |    | SS                                                                                    | 18                                                                                    |     |    |    |       |  |
| 14                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 15                  | SAND, fine grained, light brown, moist, medium dense to dense (SP)                                      |   | COARSE ALLUVIUM | 22                                                                  | M                                                                                   |    | SS                                                                                    | 20                                                                                    |     |    |    |       |  |
| 16                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 17                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 18                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 19                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 20                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 21                  |                                                                                                         |                                                                                     |                 | 41                                                                  | M                                                                                   |  | SS                                                                                    | 24                                                                                    |     |    |    |       |  |
| 22                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 23                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 24                  |                                                                                                         |                                                                                     |                 | SAND, fine to medium grained, light brown, moist, medium dense (SP) |  | 27                                                                                    | M                                                                                     |  | SS  | 20 |    |       |  |
| 25                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 26                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 27                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 28                  | SAND, a little gravel, fine to medium grained, light brown, moist, dense (SP)                           |  |                 |                                                                     | 45                                                                                  | M                                                                                     |  | SS                                                                                    | 22  |    |    |       |  |
| 29                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 30                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 31                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 32                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 33                  | SAND, fine grained, light brown, moist, dense (SP)                                                      |  |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 34                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 35                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| 36                  |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |
| END OF BORING       |                                                                                                         |                                                                                     |                 |                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |     |    |    |       |  |

| DEPTH: DRILLING METHOD   |           | WATER LEVEL MEASUREMENTS |       |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--------------------------|-----------|--------------------------|-------|---------------|--------------|---------------|----------------------|-------------|----------------------------------------------------------------------------------|
|                          |           | DATE                     | TIME  | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |                                                                                  |
| 0-34½'                   | 3.25" HSA | 9/4/25                   | 10:44 | 36.5          | 34.5         | 36.5          |                      | None        |                                                                                  |
|                          |           | 9/4/25                   | 10:54 | 36.5          | 34.5         | 36.3          |                      | None        |                                                                                  |
| BORING COMPLETED: 9/4/25 |           |                          |       |               |              |               |                      |             |                                                                                  |
| DR: JC LG: GH Rig: 110   |           |                          |       |               |              |               |                      |             |                                                                                  |

AET CORP W/LAT+LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET-CPT+WELL.GDT 10/20/25





# SUBSURFACE BORING LOG

| AET JOB NO: <b>P-0045582</b>                                |                                                                                              | LOG OF BORING NO. <b>B-10 (p. 1 of 1)</b> |    |    |                              |            |                          |     |    |    |       |  |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------|----|----|------------------------------|------------|--------------------------|-----|----|----|-------|--|
| PROJECT: <b>New Nicollet Redevelopment; Minneapolis, MN</b> |                                                                                              |                                           |    |    |                              |            |                          |     |    |    |       |  |
| SURFACE ELEVATION: <b>881</b>                               |                                                                                              | LATITUDE: <b>44.949878</b>                |    |    | LONGITUDE: <b>-93.277576</b> |            |                          |     |    |    |       |  |
| DEPTH<br>IN<br>FEET                                         | MATERIAL DESCRIPTION                                                                         | GEOLOGY                                   | N  | MC | SAMPLE<br>TYPE               | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |       |  |
|                                                             |                                                                                              |                                           |    |    |                              |            | WC                       | DEN | LL | PL | %#200 |  |
| 1                                                           | FILL, a mixture of sand and silty sand with gravel and a piece of coal, brown and dark brown | FILL                                      | 11 | M  | X                            | SS         | 12                       |     |    |    |       |  |
| 2                                                           |                                                                                              |                                           |    |    |                              |            |                          |     |    |    |       |  |
| 3                                                           |                                                                                              |                                           |    |    |                              |            |                          |     |    |    |       |  |
| 4                                                           | SAND WITH GRAVEL, fine to medium grained, light brown, moist, medium dense (SP)              | COARSE ALLUVIUM                           | 15 | M  | X                            | SS         | 18                       |     |    |    |       |  |
| 5                                                           |                                                                                              |                                           |    |    |                              |            |                          |     |    |    |       |  |
| 6                                                           | END OF BORING                                                                                |                                           |    |    |                              |            |                          |     |    |    |       |  |
|                                                             |                                                                                              |                                           |    |    |                              |            |                          |     |    |    |       |  |

|                          |  |                            |       |                          |              |               |                      |             |                                                                                  |
|--------------------------|--|----------------------------|-------|--------------------------|--------------|---------------|----------------------|-------------|----------------------------------------------------------------------------------|
| DEPTH: 0-4'              |  | DRILLING METHOD: 3.25" HSA |       | WATER LEVEL MEASUREMENTS |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|                          |  | DATE                       | TIME  | SAMPLED DEPTH            | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |                                                                                  |
|                          |  | 9/5/25                     | 11:45 | 6.0                      | 4.0          | 5.8           |                      | None        |                                                                                  |
| BORING COMPLETED: 9/5/25 |  |                            |       |                          |              |               |                      |             |                                                                                  |
| DR: JC LG: GH Rig: 110   |  |                            |       |                          |              |               |                      |             |                                                                                  |

AET\_CORP W\AT+LONG P-0045582 NEW NICOLLET REDEVELOPMENT MINNEAPOLIS MN.GPJ AET+CPT+WELL.GDT 10/20/25



# Appendix B

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## Geotechnical Report Limitations and Guidelines for Use

## Appendix B

### Geotechnical Report Limitations and Guidelines for Use

#### Report No. P-0045582

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#### B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA<sup>1</sup>, of which, we are a member firm.

#### B.2 RISK MANAGEMENT INFORMATION

##### B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

##### B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

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## **Appendix B**

### **Geotechnical Report Limitations and Guidelines for Use**

#### **Report No. P-0045582**

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#### **B.2.3 Read the Full Report**

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

#### **B.2.4 You Need to Inform Your Geotechnical Engineer About Change**

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

#### **B.2.5 Most of the “Findings” Related in This Report Are Professional Opinions**

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

#### **B.2.6 This Report's Recommendations Are Confirmation-Dependent**

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

#### **B.2.7 This Report Could Be Misinterpreted**

Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

#### **B.2.8 Give Constructors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the

## **Appendix B**

### **Geotechnical Report Limitations and Guidelines for Use**

#### **Report No. P-0045582**

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report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

#### **B.2.9 Read Responsibility Provisions Closely**

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

#### **B.2.10 Geoenvironmental Concerns Are Not Covered**

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

#### **B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold**

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.